MACHINERY

Design—Construction—Operation

Volume 43 | DECEMBER, 1936 | Number 4

The deposition of cutting edges of high-grade steel on a shank of a cheaper grade, by using an electric welding rod for that purpose, promises to become of increasing importance in the metal-cutting industries. An article in January MACHINERY will deal with this subject and record some of the results obtained. Other important subjects to be dealt with are up-to-date broaching practice, the determination of clearances and shearing pressures in blanking dies, and the influence of welding on machine design.

PRINCIPAL ARTICLES IN THIS NUMBER

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MACHINERY

Volume 43 NEW YORK, DECEMBER, 1936 Number 4

The Rapid Advance of Internal Centerless Grinding

This Comparatively Recent Process is Now Being Applied for Finishing a Variety of Work in which the Bore Must be Closely Concentric with an Outside Cylindrical Surface

By D. C. PAGE
Heald Machine Co., Worcester, Mass.

TWO and one-half years ago, when internal centerless grinding was first introduced, this process was practically confined to finishing straight open holes of small or medium size concentric with a previously ground outside surface. The process was intended primarily for the accurate grinding of bores in such parts as the races of ball and roller bearings.

Today internal centerless grinding is being applied for finishing straight holes as large as 8 inches in diameter, as well as single- and double-tapered bores, and bores that are closed at one end. Parts with tapered and "shouldered" outside surfaces are now also being ground internally by this method. Work-pieces that have come to be considered more or less standard for this process are shown in Fig. 1. The remaining illustrations show actual operations on these and other parts and emphasize the extensive advances that have been made by internal centerless grinding. All of the operations shown are performed on machines built by the Heald Machine Co., Worcester, Mass.

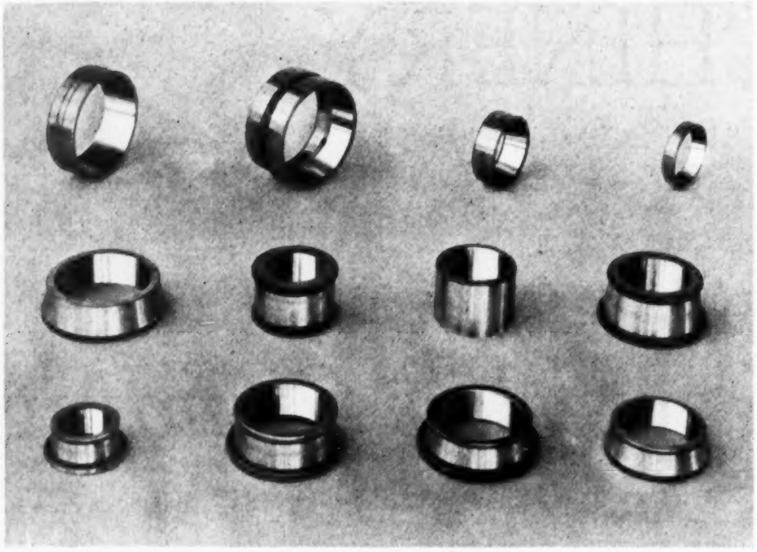


Fig. 1. Internal Centerless Grinding is Now Applied to Finishing Straight and Tapered Bores in Parts with Cylindrical, Tapered, or "Shouldered" Outside Surfaces

In grinding bores by the centerless method, a previously ground outside cylindrical surface on the work is utilized for holding and rotating the part in proper relation with the grinding wheel. This insures concentricity of the bore with the finished outside surface and also uniform wall thicknesses. The method will be understood by reference to the heading illustration, which shows a part of medium size located and supported by a large roll on the right-hand side and two medium-sized rolls on the opposite side.

The large or "regulating" roll drives the work, and at the same time prevents it from attaining too high a speed due to its contact with the rapidly revolving grinding wheel. The upper left-hand roll exerts sufficient pressure on the work to hold it in proper contact with the regulating roll and the lower supporting roll. As the grinding of each part is completed, the pressure roll is lifted, generally by an automatic means, to permit ejection of the work over the top of the regulating roll. A complete description of this type of machine appeared in March, 1934, MACHINERY, page 420. Parts of less than about 1 3/8 inches outside diameter are generally supported on the bottom by means of a narrow blade instead of the third roll.

In the average operation, bores can be ground to size within 0.0003 inch, and concentric, straight, and round within 0.0001 inch. Either the Gage-Matic or Size-Matic method of automatically controlling the finished size of work can be used on these internal centerless machines.

Airplane Engine Sleeves Ground Internally by the Centerless Method

Cylinder sleeves for airplane engines are being ground in a special machine, the centerless unit of which is illustrated in Figs. 2 and 3. This centerless unit differs from the standard design in that the sleeves are loaded and unloaded manually and endwise of the unit. The machine has a capacity for sleeves from 4 to 8 inches in diameter and up to 16 inches long. On one installation, it is used

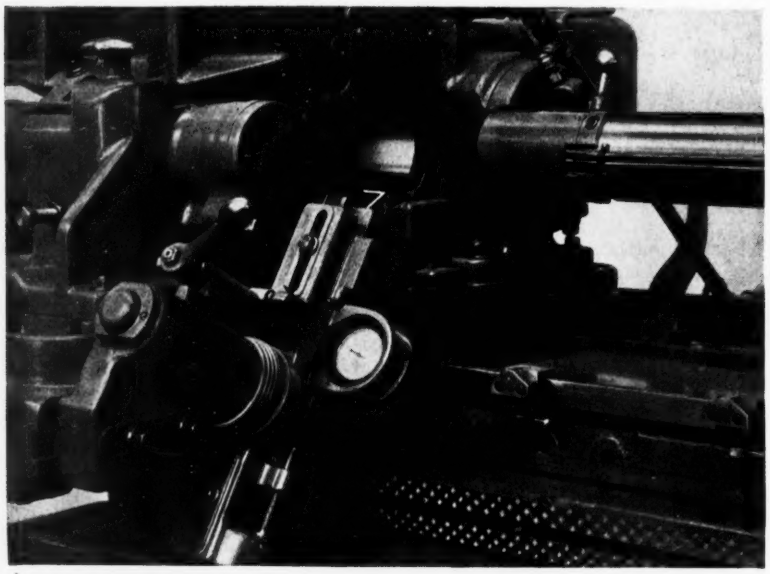
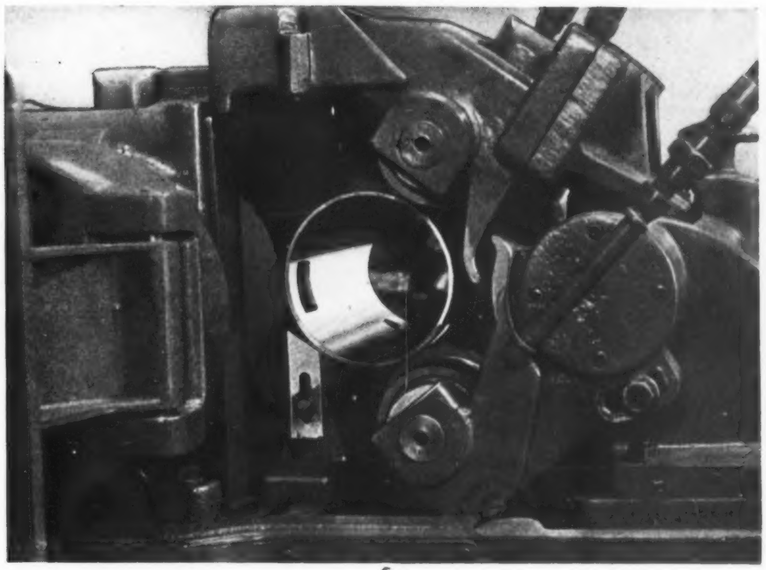


Fig. 2. Sleeves from 4 to 8 Inches Outside Diameter and up to 16 Inches Long can be Ground Internally while Supported between Rolls in this Centerless Grinder

Fig. 3. Rear View of the Centerless Unit Illustrated in Fig. 2, Showing a Sleeve for an Airplane Engine Cylinder at the Completion of the Internal Grinding Operation



for sleeves of 5 inches inside diameter and 5.1965 inches outside diameter, the walls being 0.098 inch thick. These sleeves are finish-ground on the outside surface before they are brought to the internal grinding operation. They are ground internally to the specified diameter within plus 0.0010 inch and minus 0.0000 inch, and are concentric within 0.0002 inch for their entire length.

The supporting roll seen below the work at the right in Fig. 3 is adjustable to suit sleeves of various diameters. The pressure roll above it is mounted on a trunnion which swivels in precision ball bearings. The bracket carrying the pressure roll is swung to and from the work by means of a hand-lever for reloading purposes. The pressure roll is also adjustable to suit various work diameters and the regulating roll can be adjusted to compensate for redressings.

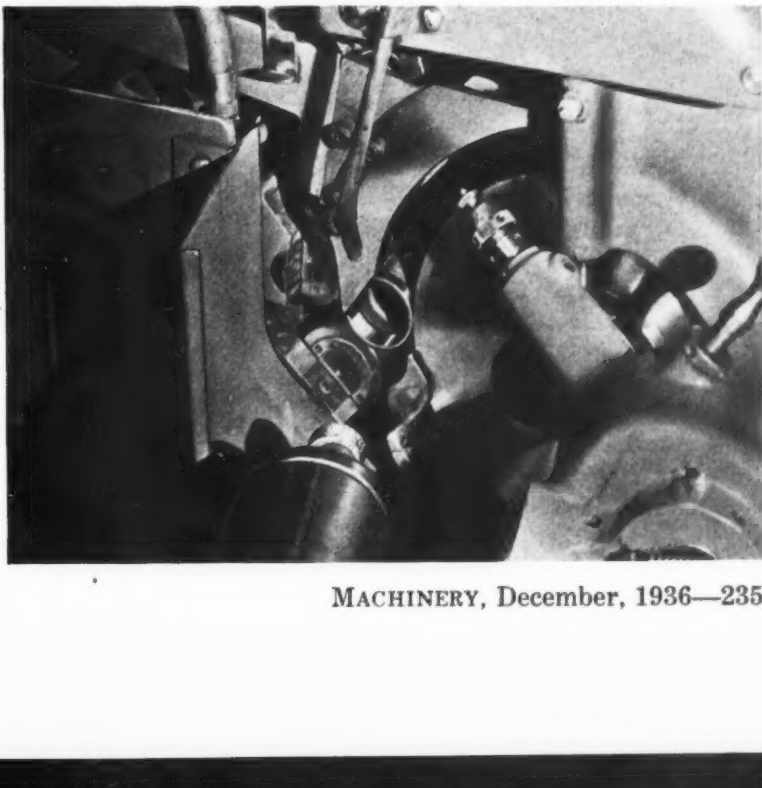
The indicator seen at the front of the machine in Fig. 2 registers readings taken on the diameter of the work by moving a diamond-pointed finger along the surface being ground. This finger can be withdrawn entirely from the machine during loading and can be withdrawn partly from the surface of the work during rough grinding. It is brought into contact with the ground surface by operating the lever that may be seen mounted on the unit.

Grinding Tapered Holes is Effected by an Easy Machine Adjustment

For grinding tapered holes in parts having a cylindrical outer surface, it is merely necessary to position the entire roll unit so that the angular surface to be ground will be in a straight line with respect to the grinding side of the grinding wheel. This arrangement will be apparent from Fig. 4. Each part is located accurately endwise by means of a backing plate.

Bearing races of the double-tapered type (see second part from the left end of the upper row in Fig. 1) can be ground on both tapered surfaces with the equipment shown in Fig. 4 by merely re-

Fig. 4. Tapered Bores are Finished by Positioning the Centerless Unit at an Angle, so as to Bring the Surface to be Ground into a Straight Line with the Grinding Wheel



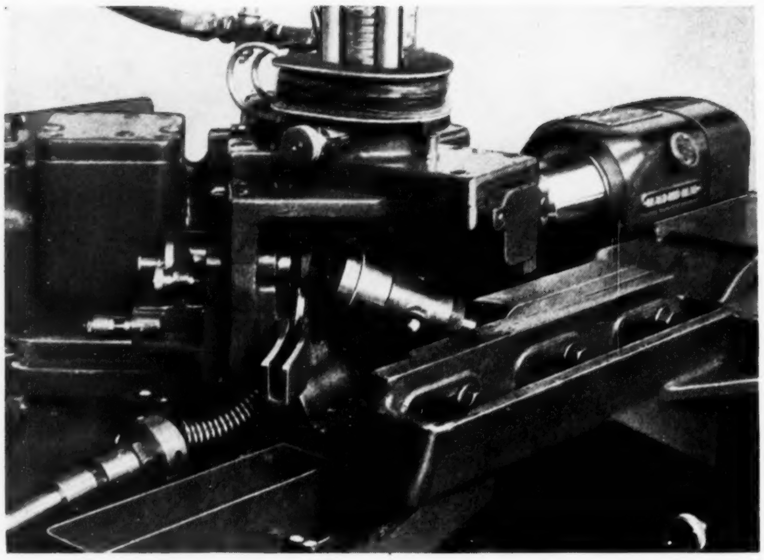


Fig. 5. The Beveled Surface of Valve-seat Inserts for Automobile Cylinder Blocks is Finish-ground at Production Rates up to 180 Pieces an Hour

chucking the work, end for end, after one tapered surface has been finished.

Valve-seat inserts for automobile cylinder blocks are ground on the beveled seat in a machine equipped as shown in Fig. 5. Unusually close limits are held on these parts, both for dimensions and concentricity of the seat in relation to the periphery of the part. The inserts are fed from a vertical magazine and leave the machine through a trough seen extending toward the foreground in the illustration. The roll that is seen in an angular position is the pressure roll. It was swung back at the time the photograph was taken to permit a finished piece to be discharged. During an operation this roll is positioned horizontally in the ordinary manner.

How Parts with Shoulders are Supported

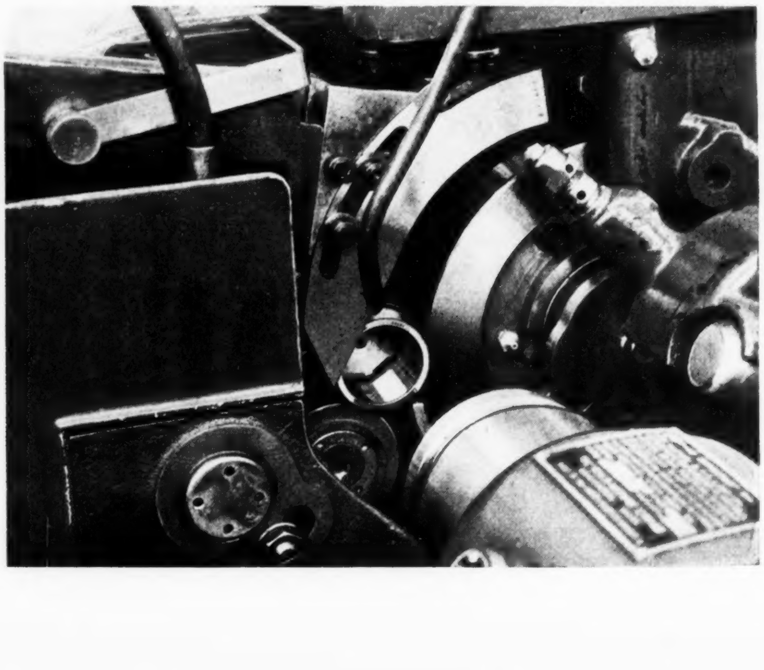
A roller-bearing race with a tapered surface and two shoulders on the outside is ground internally with the equipment shown in Fig. 6. This part is supported on the tapered surface, and therefore the rolls are also tapered. The rolls are relieved to clear the shoulders on the work.

Narrow parts can sometimes be ground in multiple, as illustrated in Fig. 7, where eleven thrust bearing races are shown being finished internally at one time. The rolls of the centerless unit are relieved, so that each thrust bearing race is supported and driven separately. Multiple grinding has greatly reduced manufacturing costs in the finishing of these parts.

Small Parts are Supported on the Underneath Side by a Rigid Blade

Internal centerless grinding has been found feasible for grinding bores as small as 0.3574 inch in diameter. This is being done on roll bushings for Diesel engines which have an outside diameter of only 0.5512 inch. The operation, illustrated in Fig. 8, requires the use of a narrow blade for supporting the part on the under side instead of the

Fig. 6. Bearing Races that are Tapered on the Outside Require a Tapered Face on the Rolls of the Centerless Unit. The Rolls are also Recessed to Clear the Shoulders on the Work



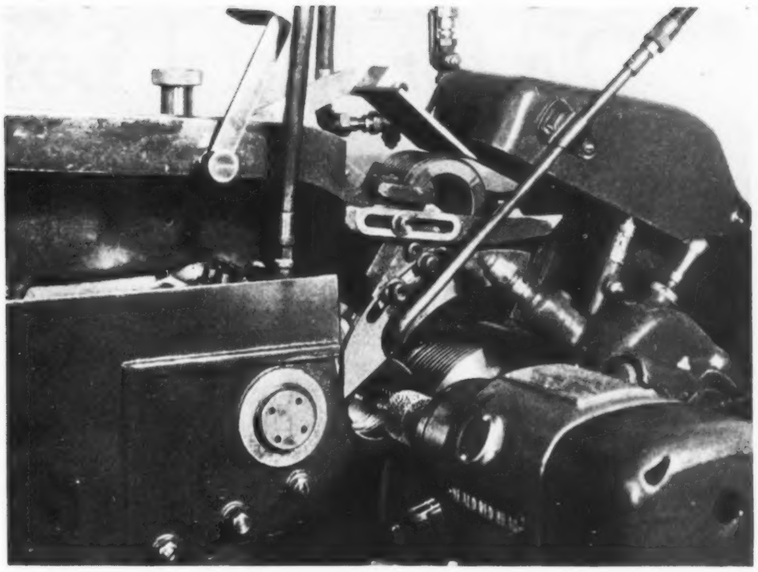


Fig. 7. Eleven Thrust Bearing Races Being Ground at One Time. Each Piece is Supported and Driven Individually by the Rolls of the Centerless Unit

roll used for medium-sized and large work. The blade is positioned at an angle in this instance, as the grinding wheel is a considerable height above a horizontal axis through the regulating roll. In other operations on small parts the supporting blade is frequently vertical.

Internal centerless grinding has been applied recently for grinding the rolls of power transmission chains. By grinding these rolls and the chain bushings, it has been found that the chain can be assembled with greater accuracy as to pitch diameter than was previously possible. In addition, the chain operates more quietly and has a considerably longer life.

Universal joint bushings for automobiles constitute an example of blind-hole grinding by the centerless method. These parts are approximately 1 1/16 inches outside diameter. The hole, which is closed at one end, must be finish-ground to a diameter of 0.847 inch for a length of 15/16 inch. This operation is being performed at the rate of approximately 160 pieces an hour.

What is "Industry?"

As defined by S. Wells Utley, president of the Detroit Steel Casting Co., in a recent address, industry is a cooperative effort between investors representing capital, business men and engineers representing management, and those who labor with their brains and hands so that iron ore, fertile fields, growing trees, or stagnant oil in the ground may be made of greater value to all human beings. Industry represents the effort of groups of men to increase the wealth of a nation through the production of goods or the furnishing of services. Wealth, as used in this sense, consists of all desirable things that human beings want, be it herds of cattle, fields of grain, foodstuffs, homes, furniture, or any other of the thousands of useful things produced by human effort. Wealth is not money, it is not coin or currency, it is not coupons or dividend checks, it is not monetary capital or credit; these latter are but the tokens of value used in industry and commerce.

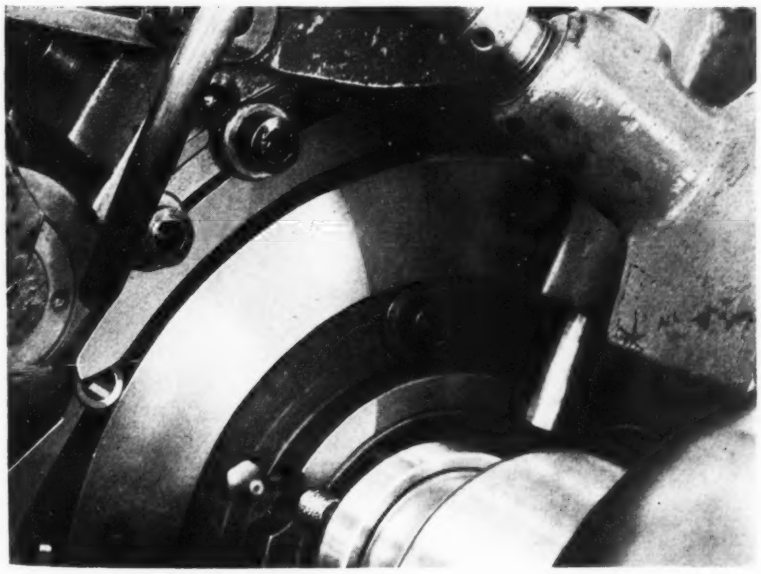


Fig. 8. Employing the Internal Centerless Grinding Method for Finishing a Hole that is Less than 3/8 Inch in Diameter; the Outside Diameter of the Piece is About 9/16 Inch

Die for Metal Box with Folded Corners and Tapered Sides

By VICTOR ARKIN

A STRONG but comparatively light weight container consisting of a formed sheet-metal box and cover is used by the large moving picture producers for storing films. The box, which is shown in Fig. 1, is a little over 11 inches square and about 1 1/2 inches deep. The cover is approximately the same depth and fits over the box. Both the box and its cover are formed from approximately square sheet-metal blanks by dies that bend up the four sides and fold over the corners. The corners thus provided are waterproof and similar to those on bread pans. Unlike a bread pan, however, the top of the box is made smaller than the bottom, so that the cover, which is larger at the open side, can be easily removed. For the same reason, and also to permit having the cover a close fit on the box, the bead or curl at the edge of the latter, as well as the folding of the corners, is turned toward the inside of the box, as shown in Fig. 1. In the case of the cover, the folds of the corners and the bead are turned or curled toward the outside.

The dies for producing the sheet-metal blanks for the box and the cover, as well as the dies for the final forming of the cover are of conventional designs. The die for the final forming operation on the box, however, is of unusual design, as shown in Fig. 3. This die has a collapsible punch which opens and closes automatically and which is used in an ordinary single-action punch press. It bends the four sides of the box past the vertical position, so that they slant inward toward the top, folds the corners in, and beads or curls the edges inward in one operation. A corner of a blank as it appears before this final forming operation is shown at *A*, Fig. 2. The finished corner is shown at *B*. The corners of the box and cover are prevented from opening or unfolding by the bead going over the top edge of the folded corners and thereby locking them in that position.

At *C*, Fig. 3, the die is shown open, ready to receive the blank which has the corners and sides partly formed, as shown at *A*, Fig. 2. The die for performing this preliminary operation is of ordinary design. The forming punch is shown at the top of its stroke at *A*, Fig. 3, ready to descend. The plug *H*, however, is in the down position so that the four forming blocks *I* are in the open or spread position. The plate *J* which carries these blocks is also in the expanded position, away from the punch-holder *K*. When the press is tripped, the descending punch comes in contact with the top of the blank placed on part *L*, view *C*. The size and number of springs *M*, view *D*, are sufficient to overcome the resistance of spring *N*, view *F*, as well as the resistance offered by the blank, so that part *L* is pushed down to the bottom of the die. It will be noted that up to this point in the forming operation, no change has taken place in the positions of any of the parts of the punch, but that the die parts *O* have folded inward against blocks *I* which comprise the expanding punch. The blank or box is now formed and the corners are folded. As the ram of the press continues downward, it compresses springs *M* and brings part *K* in contact with plate *J*.

In the last movement, three distinct operations

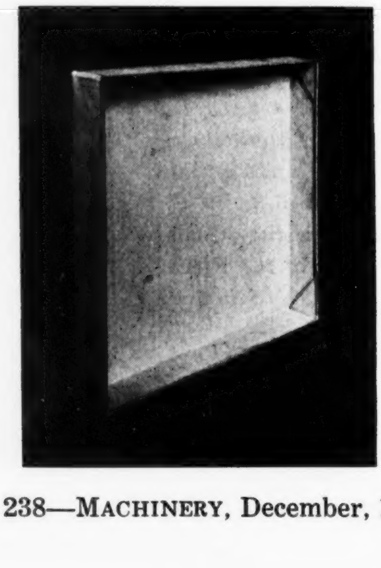
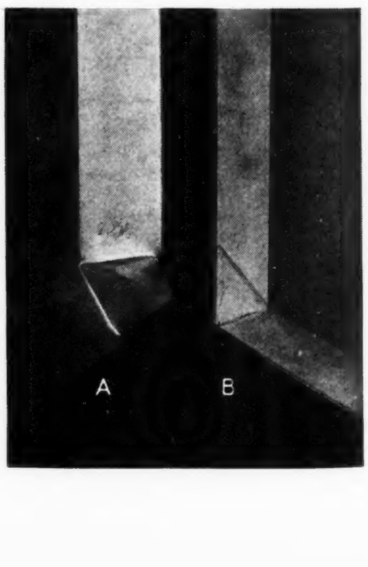


Fig. 1. (Left) Tapered Sheet-metal Box with Corners Folded on Inside and Edges Curled Inward

Fig. 2. (Right) (A) One of Four Partly Formed Corners of Blank for Box Shown in Fig. 1; (B) Corner Shown at A after being Folded and Beaded by Die Shown in Fig. 3



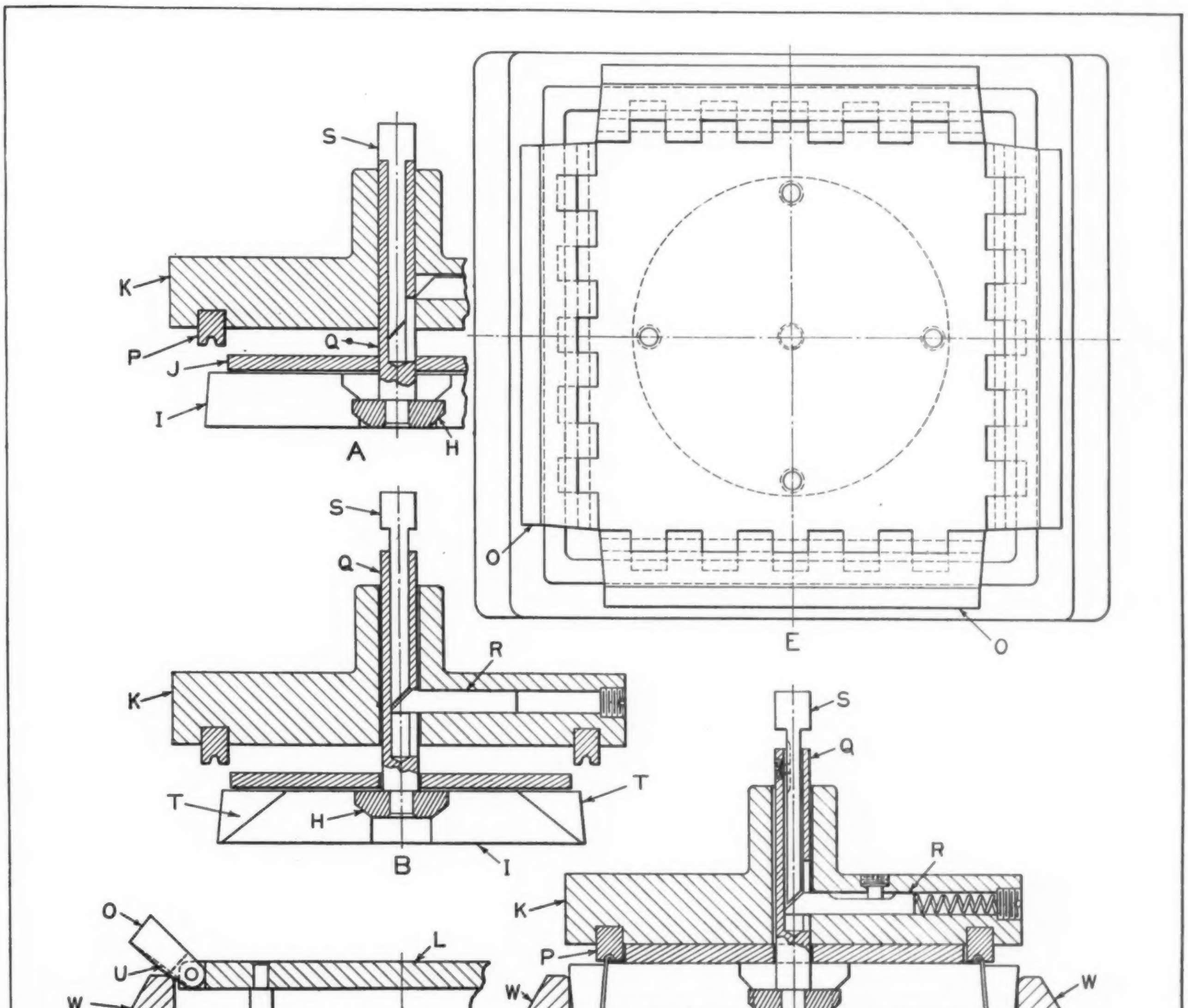


Fig. 3. Plan and Assembly Views of Punch and Die Used in Producing the Box Shown in Fig. 1

take place: First, parts P curl over the edges of the box while it is being held in the die by punch I; second, the shank Q, secured to the plug H, is pushed upward to its top position, thus bringing the slot or opening in its side in line with part R: third, part R, actuated by a backing spring, comes through the opening in part Q, and being beveled at an angle of 45 degrees, pushes rod S into its upper position.

View F shows the punch and die in the final closed position, with the ram of the press all the way down. On the ascending stroke, the part Q is locked to the punch-holder K by part R and moves upward with the punch-holder. The expanded punch I, through the action of springs M, remains down in contact with part L until plug H has been withdrawn from its low position into the upper position, as shown in view B. The four punch sections I can then contract or move inward sufficiently to permit them to be withdrawn freely from the formed and curled box, which remains on top of the die part L as the press ram continues its upward movement. From the illustrations, it is evident that the parts I move inward in the direction indicated by the arrow at X when the punch sections recede or collapse. At this point in the upward movement of the press ram, the hinged forming members O swing open, as indicated in view C.

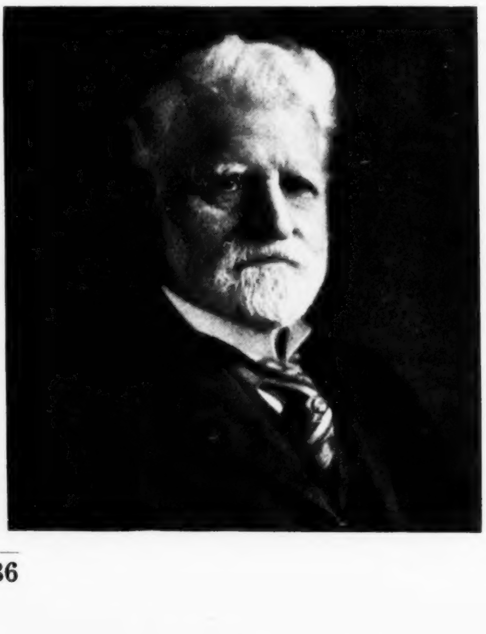
The view at B shows the punch with its parts in the positions they occupy after leaving the die on the upward movement, but before the punch reaches its extreme top or stationary position. It will be noted that the punch members I are still contracted and that the locking device R is still in part Q. As the punch continues upward the head of part S comes in contact with the punch press knock-out. This causes part S to be pushed into part Q and thus disengage the locking plunger R. As the head of part S comes in contact with part Q, it, in turn, pushes plug H down into its lower position, thereby expanding the punch members I. The press ram is now in its extreme upward position and the punch is expanded as shown in view A ready to repeat the forming operation on a new piece of work.

Details of the punch, including plug H and expanding members I, are shown in the plan view G. In this view, the members I are shown in the expanded position. View E is a plan of the top of the die with parts O in their open positions.

In order to make sure that the ears or folds in the corner of the box will always come on the same sides, where clearance has been provided for them in the punch members I, as shown at T in view B, two of the parts O are machined thinner than the others, as indicated by the dotted lines at U, view C. This causes the two thicker members O, which are opposite each other, to close first. The closing movements of the other two members O, which are also opposite each other, follows. This insures always folding the corners on the same sides of the die. To further facilitate this action, part V has two of its flanges W higher than the other two.

Engineers Honor Ambrose Swasey with the Hoover Medal

AMBROSE SWASEY, chairman of the Warner & Swasey Co., Cleveland, Ohio, and frequently known as the Dean of American engineers, will receive the Hoover Gold Medal, awarded by America's four leading engineering societies—the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, and the Institute of Mining and Metallurgical Engineers—on the occasion of the annual dinner of the Society of Mechanical Engineers at the Hotel Astor, New York City, December 2. The medal, which was established by Conrad N. Lauer, of Philadelphia, through a trust fund, to commemorate the civic and humanitarian achievements of Herbert Hoover, the first recipient of the medal, is "awarded by engineers to a fellow engineer for distinguished service." The presentation precedes by less than three weeks the celebration of Mr. Swasey's ninetieth birthday, on December 19. Mr. Swasey today holds all the major scientific awards which the engineering profession can confer upon a fellow engineer, the John Fritz Medal, the Franklin Gold Medal, the Medal of the American Society of Mechanical Engineers, and the Washington Award.



Mr. Swasey is a past-president and honorary member of the American Society of Mechanical Engineers. In 1914, he made the initial gift which established the Engineering Foundation "for the furtherance of research in science and engineering, or for the advancement in any other way of the profession of engineering for the good of mankind."

MECHANICAL PROPERTIES OF SAND-CAST ALUMINUM ALLOYS[1]—1

(For footnotes see Data Sheet No. 336)

ALLOYS	Minimum Values for Specifications: Tension(3): Ultimate Strength Lbs. per Sq. In.	Minimum Values for Specifications: Tension(3): Elongation Per Cent in 2 Inches	Typical Values (Not Guaranteed): Tension(3): Yield Strength(2) (Set=0.2%) Lbs. per Sq. In.	Tension(3): Ultimate Strength Lbs. per Sq. In.	Tension(3): Elongation Per Cent in 2 Inches	Compression(6): Yield Strength(2) (Set=0.2%) Lbs. per Sq. In.	Compression(6): Ultimate Strength Lbs. per Sq. In.	Hardness: Brinell 500 kg. 10 mm. Ball	Shear: Shearing Strength(4) Lbs. per Sq. In.	Fatigue: Endurance Limit(5) Lbs. per Sq. In.	Density: Lbs. per Cu. In.
12 and 212	19,000	(8)	14,000	22,000	2.0	16,000	38,000	65	20,000	7,500	0.102
43	17,000	3.0	9,000	19,000	4.0	9,000	25,000	40	15,000	6,500	0.096
47(7)	24,000	5.0	11,000	26,000	8.0	12,000	28,000	50	18,000	6,000	0.095
108	19,000	1.5	17,000	21,000	2.0	21,500	43,000	60	20,000	8,500	0.099
109	21,000	(8)	18,000	24,000	1.5	23,500	45,000	75	20,000	10,000	0.105
112	19,000	(8)	14,000	22,000	2.0	24,000	44,000	70	20,000	8,500	0.103
122-T2	23,000	(8)	21,000	25,000	1.0	33,500	54,000	75	25,500	9,500	0.106
122-T61	30,000	(8)	30,000	36,000	1.0	40,500	80,000	100	29,500		0.106
142	23,000	(8)	24,000	28,000	1.0	34,000	52,000	85	24,000	8,000	0.101
142-T61	32,000	(8)		37,000	0.5	58,000	70,000	100	32,000	8,000	0.101
142-T571	29,000	(8)	28,000	30,000	0.5	30,000	77,000	85	27,000	8,000	0.101
195-T4	29,000	6.0	16,000	31,000	8.0	27,000	43,000	65	28,000	6,000	0.100
195-T6	32,000	3.0	22,000	36,000	4.0	29,000	48,000	80	30,000	6,500	0.100
195-T62	36,000	(8)	27,000	40,000	2.0	45,500	56,000	95	31,000	7,000	0.100
214	22,000	6.0	12,000	25,000	9.0	12,000	50,000	50	19,000	5,500	0.095
216	25,000	4.0	16,000	27,000	6.0	15,000	57,000	60	23,500		0.094
220-T4	42,000	12.0	25,000	44,000	13.0	23,500	72,500	75	33,500	7,000	0.092
A334	22,000	(8)	20,000	26,000	1.5	20,000	70,000	65	24,000		0.099

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MACHINERY'S Data Sheet No. 335, New Series, December, 1936

MECHANICAL PROPERTIES OF SAND-CAST ALUMINUM ALLOYS[1]—2

ALLOYS	Minimum Values for Specifications: Tension(3): Ultimate Strength Lbs. per Sq. In.	Minimum Values for Specifications: Tension(3): Elongation Per Cent in 2 Inches	Typical Values (Not Guaranteed): Tension(3): Yield Strength(2) (Set=0.2%) Lbs. per Sq. In.	Tension(3): Ultimate Strength Lbs. per Sq. In.	Tension(3): Elongation Per Cent in 2 Inches	Compression(6): Yield Strength(2) (Set=0.2%) Lbs. per Sq. In.	Compression(6): Ultimate Strength Lbs. per Sq. In.	Hardness: Brinell 500 kg. 10 mm. Ball	Shear: Shearing Strength(4) Lbs. per Sq. In.	Fatigue: Endurance Limit(5) Lbs. per Sq. In.	Density: Lbs. per Cu. In.
355-T4	27,000	4.0	20,000	30,000	5.0	25,000	65,000	60	30,000		0.097
355-T6	32,000	2.0	27,000	35,000	3.0	29,000	68,000	80	30,000		0.097
355-T51	25,000	(8)	23,000	28,000	1.5	24,000	52,000	60	21,000	6,500	0.097
A355-T51	25,000	(8)	24,000	28,000	1.5	24,000	54,000	65	21,000	8,000	0.099
A355-T59	23,000	(8)	21,000	25,000	2.0	21,000	52,000	60	20,000	8,000	0.099
356-T4	26,000	5.0	16,000	28,000	6.0	16,000	46,000	55	22,000		0.095
356-T6	30,000	3.0	22,000	32,000	4.0	21,000	48,000	70	23,000	8,000	0.095
356-T51	23,000	(8)	20,000	25,000	2.0	17,000	80,000	55	18,000	6,000	0.095
645	25,000	2.5	22,000	29,000	4.0	34,000	50,000	70	22,500	7,500	0.106

(1) Young's modulus of elasticity is approximately 10,300,000 pounds per square inch.
(2) Stress which produces a permanent set of 0.2 per cent of the initial gauge length. (American Society for Testing Materials Specification for Methods of Tension Testing, E 8-33.)
(3) Tension values determined from standard half inch diameter tensile test specimens individually cast in green sand molds and tested without machining off the surface.
(4) Single-shear strength values obtained from double-shear tests.
(5) Based on withstanding 500,000,000 cycles of completely reversed stress, using the R. R. Moore type of machine and specimen.
(6) Results of tests on specimens having an 1/r ratio of 16 to 20. All specimens failed by lateral bending.
(7) Properties of this alloy obtained by special foundry practice, called "modification".
(8) Not specified. The error in determining low elongations is comparable with the value being measured.

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MACHINERY'S Data Sheet No. 336, New Series, December, 1936

Reasons for the Variation in Size of Tapped Holes

A Brief Analysis of the Principal Causes of Lack of Uniformity in Tapped Holes

By H. GOLDBERG, Vice-President
R. G. Haskins Co., Chicago, Ill.

THERE are many reasons for the variation in the size of tapped holes. If the spindle of a tapping machine does not run true, if there is not sufficient chip room, or if the tap "loads," it is not possible to maintain a uniform size.

Most important of all is a true running spindle. There are still many who believe that it is necessary that the tap should float while tapping. This erroneous idea has been handed down like a tradition from the days when inaccuracies in taps suggested the development of floating tap-holders. Today, however, with taps ground in the thread and having shanks true with the threads, there is no reason for the use of floating holders. We would not think of mounting milling cutters or lathe tools in floating holders. We cannot expect to tap holes within a tolerance of 0.001 inch if the tap runs out many times this amount. The tapping machine spindle must have the same accuracy and rigidity as that of any other machine tool spindle.

A tap mounted in a floating spindle will not regularly produce accurate holes. When pressure is applied to it, the tap takes hold at a slightly different angle each time a hole is tapped. This often places an unnecessary strain on the tap. There is a tendency for the floating tap to wabble and to shave off a slight amount of metal from one side of the thread. When the tap is reversed, there is no support for it, because the tapped hole is larger than the tap and the tap may cut while running backward.

Chip Room is an Important Factor in Uniform Tapping Results

Sufficient chip room in the flute of the tap is another important factor in tapping. Many taps have too wide lands and too shallow flutes. This frequently causes breakage. Especially in tapping steel, the chips are crowded into the flute; and if there is not enough chip room, a greater amount of power than necessary will be required. If the chips pack too solidly into the flute, the tap is likely to break.

In smaller taps it is not possible to obtain sufficient chip space in the flutes unless fewer and narrower lands are used with more "hook" on the tap, so that it will cut more freely. Therefore, it is recommended that on taps 5/16 inch and less in diameter, three or only two flutes be used. There are certain low-carbon steels, especially cold-headed or upset steels, in which even a three-fluted tap does not allow sufficient chip room, as the metal is soft and "gummy." For this class of materials, a two-fluted tap is best. This provides a very wide flute and a narrow land, with ample chip room. In some cases, taps so designed will work successfully up to 3/8 inch in diameter, where those with three and four flutes have failed to do the work.

The crowding of chips causes trouble in holding the size of the thread. When the chips pack, there is a tendency to force the tap to cut over size and there is danger that when the tap reverses the chips will reverse with the tap and cause welding or loading. Of course there is a limit to the depth of flute and the narrowness of land that can be used in a tap. In the smaller sizes, if the tap were made with too narrow lands and too deep flutes, it would have no strength and would break easily.

Usually four-fluted taps are supplied unless three flutes are specified. Two-fluted taps are generally special; but whenever they can be used to advantage, even though they may cost more, they are usually the cheapest to use.

In tapping blind holes, many problems are involved. Attempts are often made to tap holes to the bottom when there is not sufficient chip room; broken taps and unsatisfactory threads frequently result. When a hole must be tapped to the bottom, especially in the coarser pitches, it should be done in several operations or stages.

The Effect of "Loading" or "Pick-Up" of Metal

A wabbly spindle, a floating tap-holder, or the crowding of chips may cause variations in tapped-hole sizes. These causes are purely mechanical. There is a more serious problem of variation in tapped holes due to "loading" or "pick-up" of metal on the angular surfaces of the thread. This loading is the cause of most tap breakage and of variations in tapped holes.

Certain grades of materials are more liable to this difficulty than others; some are susceptible of a slight pick-up of metal when the tap reverses. The amount so picked up can rarely be seen with

the naked eye, but a powerful glass will detect it. At first it is noticeable as a very light hair-line streak that looks like a dull slivered surface. This light streak embeds itself in the grinding scratches of the tap. With every tapped hole, a little more metal is picked up. This metal is gradually welded to the tap thread surface and ultimately causes tap breakage.

When a tap loads, there is a noticeable increase in the size of the tapped hole. The threads also become slightly roughened, which, in turn, causes additional pick-up of metal.

There are several reasons why taps load. The most important probably is the cutting lubricant; the next is the material being tapped. Every grade of material will load at some time or another, if the wrong kind of cutting oil is used; if the tap is not of the right design, having too wide a land; if the chips are crowded in the flute; if dull taps are used; or if the work shifts while tapping.

Some of these difficulties can be overcome when the reason for loading is understood; but we cannot control the internal structure of the material. Certain grades of material, like low-carbon steels that are soft and gummy, cause most of the trouble, as they expand and shrink under pressure. Seamless tubing frequently causes tap-loading troubles. Even in free-cutting screw stock, one lot of steel can be tapped more freely and will cause less trouble than another lot of the same material.

How to Overcome the Effects of Tap Loading

As a general rule, when tap loading occurs, first suspect the cutting lubricant and then examine the lands of the tap. If they are too wide, they may create too much friction and thereby cause pick-up. Using narrower lands will frequently eliminate the difficulty. Then there are certain designs of work where thin walls are necessary and where there is not sufficient support for the cutting action of the tap, so that there is too great an expansion while tapping. Sudden shrinkage when reversing will result in loading. This can be overcome by narrowing the lands of the tap, so as to create less frictional resistance.

Swaged, upset, or drawn holes will sometimes cause difficulty in tapping. There are strains set up while drawing or upsetting. When the tap starts to cut, it releases some of these strains and thereby causes shrinkage and tap loading.

It is often thought that tap loading takes place only when steel is being tapped. Certain grades of brass, however, will load a tap after it has been used for many holes, so that it looks as if it were brass-plated. This discoloration of the tap is only a slight pick-up of metal which will eventually weld to the tap surface.

In general, most tap loading is due to the cutting lubricant used. Many mechanics seem to think that any cutting oil will do for tapping, and that a brush or an oil-can is all that is necessary. When the latter practice is followed, sometimes only one tooth of the tap is oiled. Then there is the problem of dirty oil when the brush and can are used. Such oil will act as a lapping medium on the tap. It is necessary to use sufficient oil to really lubricate a tap, and it is important to use clean oil.

Effect of Tapping Machine on Variation of Tapped Holes

The range of a tapping machine may have an effect on the variation in tapped holes. Some tapping machines have too great a range, and what at first sight may appear to be an advantage turns out to be a disadvantage. If we put a small tap in a large machine, the troubles that cause variations in size may be multiplied many times by the increased weight, inertia, and lack of sensitivity of the machine. On the other hand, if we put a large tap in a small machine and crowd the machine to its capacity, high pressures are developed in starting the tap.

Often the weight of the chuck alone is detrimental in tapping over a large range, as a tap chuck that is strong enough to hold a half-inch tap would be too heavy for a No. 2 or even a No. 10 tap. For best results in tapping, tapping machines should have a comparatively narrow range of capacity.

Tapping in a screw machine involves the same problems as in a tapping machine. Usually tap-holders are designed so that they carry the maximum size tap for which the machine is rated. While this tap-holder is suitable for its maximum range, it is not satisfactory for a small tap. For this reason, there is much tap breakage in screw machine work. The holders are often too heavy. This, together with the provision for floating holders, makes it rather difficult to hold close tolerances when heavy holders are used for light taps. Holders for the screw machine should be designed according to the size of the tap rather than according to the capacity of the machine.

* * *

Information on Inquiries for Gray Iron Castings

In order to eliminate costly mistakes and establish a better understanding between the gray iron foundry and its customers, the Gray Iron Founders' Society, Inc., 1010 Public Square Bldg., Cleveland, Ohio, has adapted the data entitled "Essential Information to Accompany Inquiries" from Volume XI, 1932, of the *Transactions of the American Foundrymen's Association* to the special needs of the gray iron foundry and has published this in bulletin form. Those wishing to obtain this bulletin will receive a copy by addressing the Gray Iron Founders' Society at the address above.

Scalping Thirty-Five Copper Wire Billets an Hour

By R. R. WEDDELL

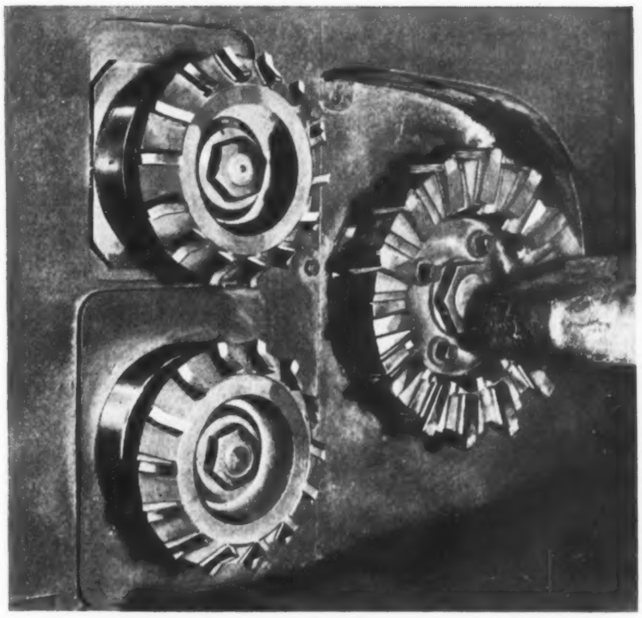


Fig. 1. Special Cutters Used in Scalping Copper Billets from which Wire is Drawn

THE scalping of copper wire billets at the rate of thirty-five an hour on a special Ingersoll milling machine is a spectacular operation involving the use of one large facing cutter and two smaller radius-milling cutters that follow the tapered outline of the billet. The special cutters used are shown in Fig. 1, and the manner in which they are arranged is indicated in Fig. 2.

The face-milling cut, which smooths the wrinkled surface of the billet, varies in depth from 1/4 to 3/8 inch, and is taken by the special extra heavy-duty cutter shown at *A*, Fig. 2. This is an Ingersoll Zee-Lock face-milling cutter 12 inches in diameter. The coarsely spaced, heavy, high-speed steel blades are set at 20-degree rake and 20-degree shear angles. These angles give the cutter remarkably free cutting action and reduce the power required. The cutting speed is over 1000 feet per minute, and the work sweeps past the cutter at the exceptionally high feeding rate of 72 inches per minute. The high speed of the cutter, however, gives a chip load of only 0.015 inch per tooth. No coolant is used. About 400 billets are milled between grinds.

The radius cutters *B* and *C* are made right- and left-hand, with inserted high-speed steel blades. They are mounted on spindles which are arranged to follow the contour of the work automatically, so that the corners of the surface faced by cutter *A* are rounded off. These cutters are driven at a cutting speed of 1000 feet per minute, which gives a chip load of 0.010 inch per tooth at the feeding rate of 72 inches per minute. Approximately 400 pieces are produced per grind.

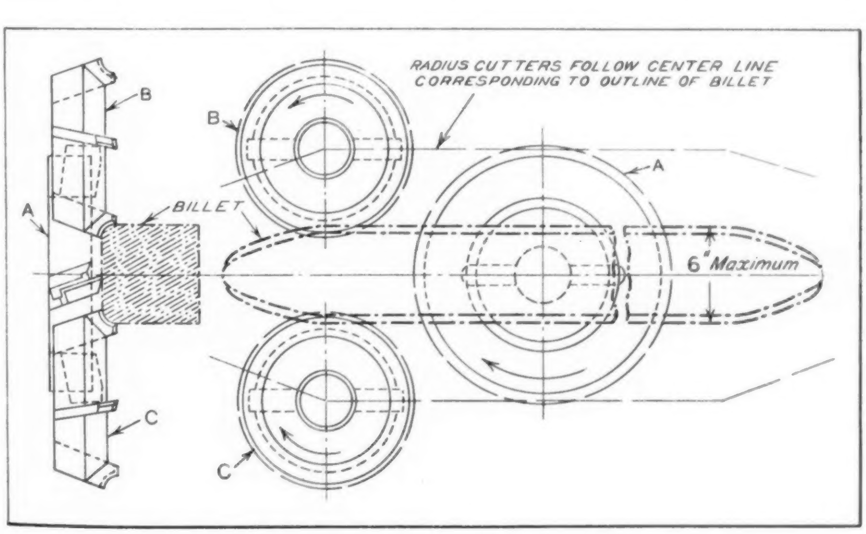


Fig. 2. Diagram Indicating Action of Cutters in Smoothing Face and Rounding Edges of Straight and Tapered Sides of Billet

* * *

Some Causes of Hot Bearings

In the publication *Oil-Ways*, A. E. Lee, lubrication assistant of the Standard Oil Co. of N. J., gives the following principal causes of hot bearings in industrial machinery: (1) Insufficient oil, the wrong type, or incorrect grade of oil. (2) Low oil pressure due to quality of oil, leak, or low supply. (3) Overloading of machine. (4) Misalignment of supported shaft. (5) Use of graphite in oil, blocking oil passage and starving bearings. (6) Dirt in oil, causing friction and blocked oil passages. (7) Water in oil eventually causing sludging, which, in turn, clogs oil screens and lines. (8) Bearing adjustment too tight, causing insufficient room for oil film. (9) Bearing adjustment too loose, causing oil to flow out of bearing too easily. (10) Excessive speed for quality and grade of lubricant. (11) Improper or impaired oil cooling.

This summary should prove a valuable aid in locating the cause of trouble.

Fixtures for Machining Irregular Shapes by Profile Milling

Fixtures with Holders of Special Design for Both the Work and the Forming Blocks Provide Means for Handling a Large Variety of Work

By F. SERVER

THE machining of parts having irregular shapes or profiles is an important factor in the manufacture of many products. In most cases, the cost of machines and tool equipment for this kind of work is considerable and the profiling operations are comparatively slow, even when the most efficient type of machine is employed.

The equipment cost can be kept at a minimum, however, by employing specially designed fixtures such as are described in this article. These fixtures are easily adapted for handling different profiling jobs. They are designed for use on a profiling machine having a one-way power or two hand feeds, two spindles, and two templet guide pins arranged to facilitate taking a roughing and a finishing cut. However, these fixtures can be employed on almost any type of machine having a table that can be fed in two directions in a plane at right angles to the cutter-spindle.

The fixture shown in Fig. 1 is employed for a radius milling operation at *R* on the work *A*, which has the form of a rectangular bar with a groove cut at *B*. The work is set up on one edge as shown. The cutter at *C* performs the radius milling operation while the work is guided by means of the pin *D* and the forming block *E*.

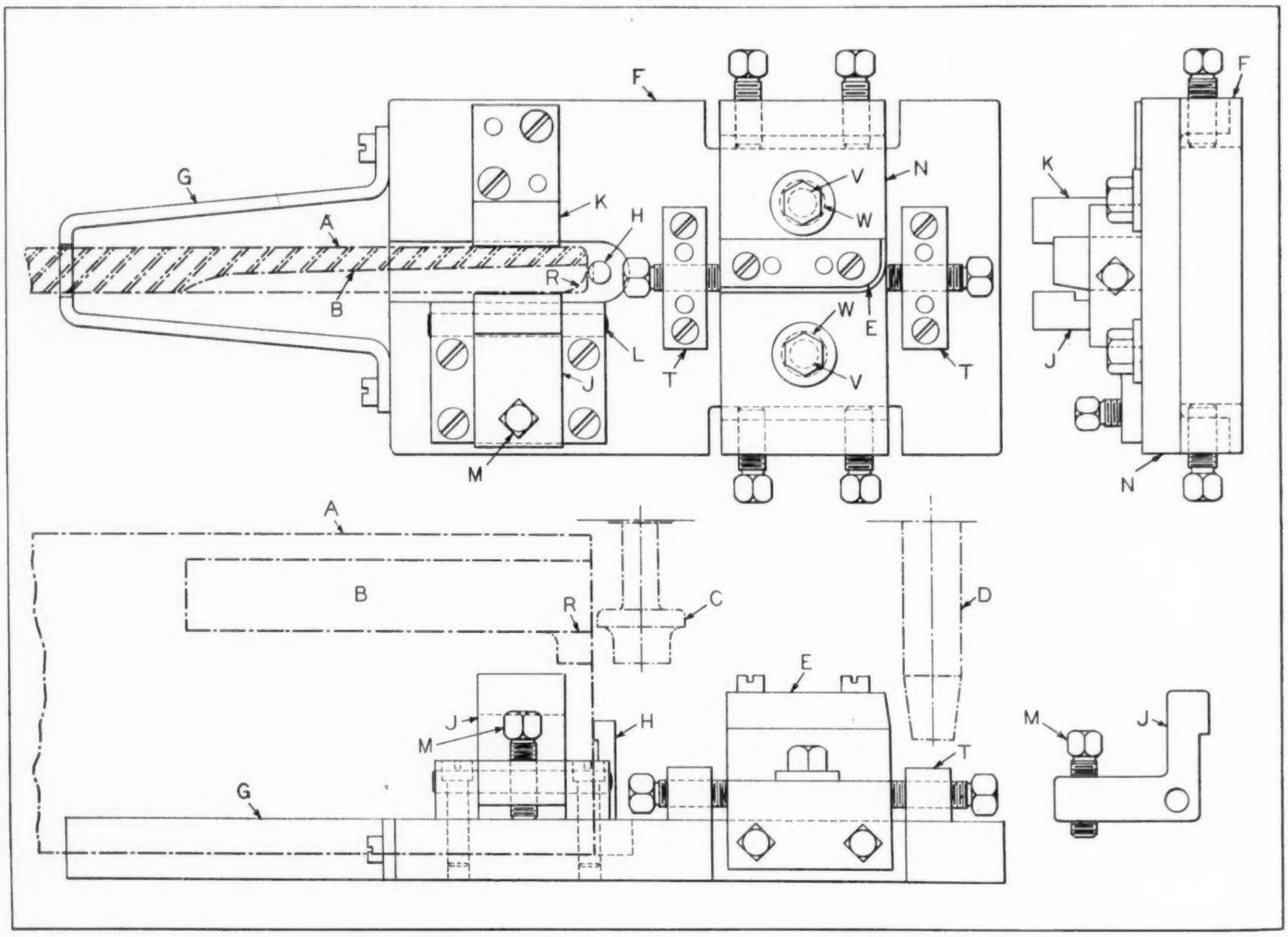


Fig. 1. Fixture Equipped with Adjustable Forming Block for Milling Radius R on Work Shown by Heavy Dot-and-dash Lines

When this fixture is used on a two-spindle type machine, the cutter and guide pin are mounted on a cross-rail head which can be fed back and forth at right angles to the longitudinal travel of the table by means of a handwheel. Another spindle and a second guide pin are mounted on the cross-rail head, thereby making two complete units, one for roughing and one for finishing. A handwheel is provided for feeding the machine table back and forth between the vertical upright housings which support the cross-rail.

By means of the two feeds, the operator can keep the forming block *E* in contact with the guide pin *D*, which results in milling the radius at *R*. For finish-milling the work after the rough-milling is completed, the spindle and guide pin of the other unit are brought into the milling position relative to the fixture, and the operation of guiding the cutter repeated. Vertical adjustment of the two tapered guide pins takes care of the allowance necessary for finishing.

A formed strip *G* attached to the base *F* of the fixture supports the overhanging work, which is located endwise against a pin *H*, while a clamp *J* grips the work against the block *K*. This clamp pivots about a hinged pin *L* as a center, being tightened by the screw *M*. Block *N* is made U-shaped and has two set-screws at each side which are used in conjunction with the set-screws in blocks *T* for convenience in aligning the forming block *E* relative to the work, so that the spacing can be adjusted to suit the center distance between the cutter-spindle and the guide pin. Two screws *V* with large washers are employed to hold the adjustable block securely in position. The holes *W* are made with sufficient clearance to permit the adjustment required.

While the preceding description pertains to the use of the fixtures when employing hand feeds, the most convenient method is to have the table operated or fed longitudinally by power while the operator employs the cross-feed to keep the guide pin in contact with the forming block.

The fixture shown in Fig. 2 is designed to have the work *X* mounted flat in a horizontal plane, while the fixture shown in Fig. 1 holds the work on edge. Referring to Fig. 2, the entire contour from *Y* to *Z* is milled with a curved edge by the cutter *C*. For this operation, the forming block *E* must be kept in contact with the guide pin *D*. The work is located in two nests, *F* and *G*, and is clamped down on two blocks *H* and *J* by the clamp *K* which is passed through the hole in the work and pivoted about stud *L* to the position shown. The work, in this case, is machined on both sides previous to the profile milling operation. Set-screws in members *M* and *N* which are in contact with block *Q* are used to adjust the forming plate *E*. This provides practically a universal adjustment for the forming block relative to the work and cutter. Screws *S* hold the forming block in place.

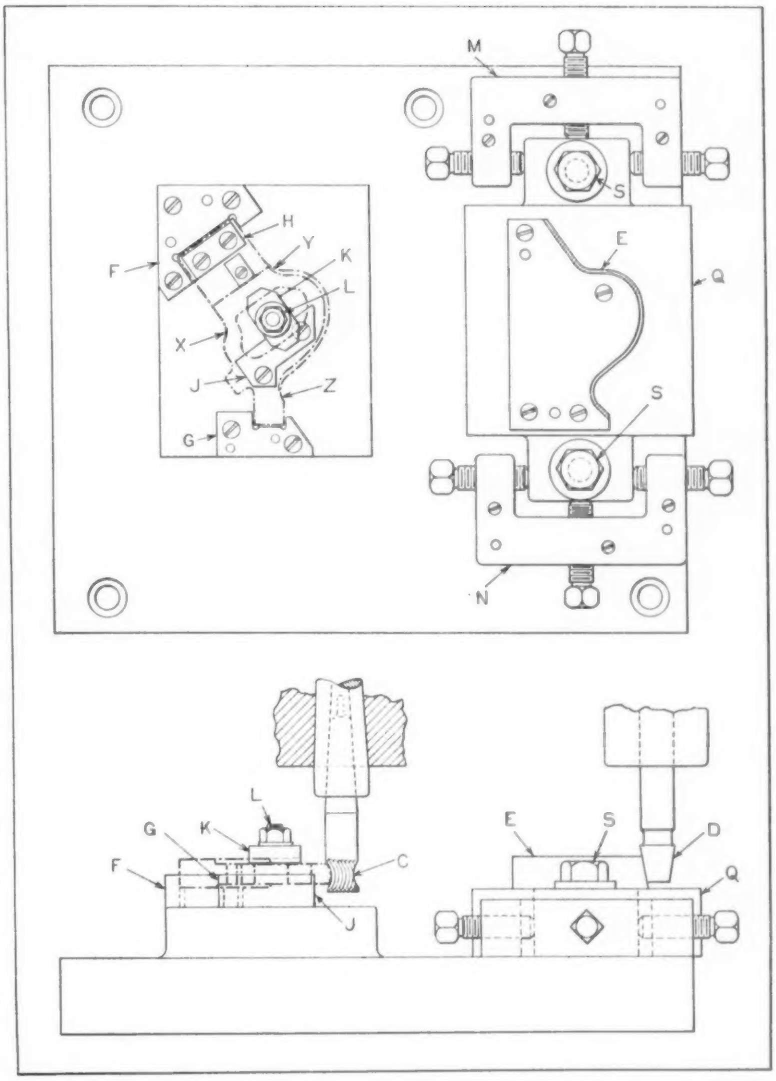


Fig. 2. Profile Milling Fixture for Finishing Edge of Work Extending from Y to Z

The fixtures shown in Figs. 1 and 2 are designed to have the guide pin operate only on the right-hand side of the forming block. This construction permits a wide range of adjustment, but is only effective for cutter compensation when profile-milling on one side of the work.

When profile-milling around the entire outline of a piece of work, a fixture such as shown in Fig. 3 may be used. In this case, no provision is made for adjusting the forming block *J*, as there is no particular advantage in having an adjustable unit when the cutter is to machine both sides of the work. As the center distance *C* between the cutter *A* and the guide pin *B* must correspond to the center distance *D*, there is obviously no need for adjustment of the forming block relative to the work,

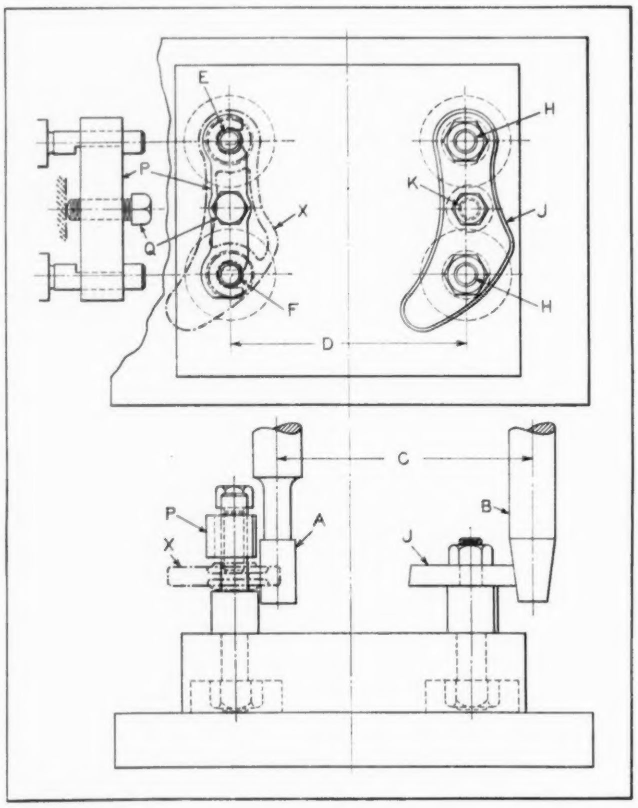


Fig. 3. Fixture for Profile-milling all around Work

the guide pin being adjustable vertically to compensate for cutter wear.

The work X in this set-up is mounted on two studs E and F. The forming block J is located on two studs H. Nuts on these studs and the center screw K serve to hold the forming block in place. The two locating studs E and F are notched out on the inside to permit the clamping block P to be quickly put in place from the side. The work is held in place by tightening the set-screw Q. With this type of clamp, it is possible to traverse the cutter around the entire outline of the work.

A center-adjusting type of profile milling fixture in which the level of the work is raised above the base of the fixture is shown in Fig. 4. This fixture is used in milling both sides of the rib-shaped part X. The side Y is finished at one setting. For finishing the side Z, the clamp A is transferred to the opposite side of the work, the clamping screw being transferred from C to B. The heel of the clamp is located on the lug of the fixture at D. The object of this reversal of the clamp is to permit the cutter to be traversed along surface Z without interference with the clamp. Underneath the clamp is a locating pin or bearing F. Another pin at G and studs H and J, which fit holes in the work, also assist in locating and clamping the work.

There is a spring pin at K which is clamped from the top by a screw in which a short pin L is inserted to facilitate hand operation. This spring pin is released against the free end of the work and a knurled-head screw M is then tightened against the work opposite the spring pin, thereby providing a rigid method of clamping. In using this fixture, it is customary to machine the entire run of work on one side, after which the fixture is changed over and the opposite side of the work is profile-milled. The fixture indicated at N is separate from the baseplate P which is attached to the machine table. This construction allows other fixtures to be used on the baseplate in place of the one shown in the illustration.

The forming block is indicated at Q. It is mounted on an adjustable member R which is held by a block S containing six set-screws, two on each side and one at each end. These set-screws are for the purpose of adjusting the forming block in four directions. The four sides of the adjustable forming block are tapered, as indicated at V, so that the clamping action of the set-screws serves to hold the forming block down securely in place in the block S, which, in turn, is held on the base by four screws and two dowels.

The width of the work to be profile-milled some-

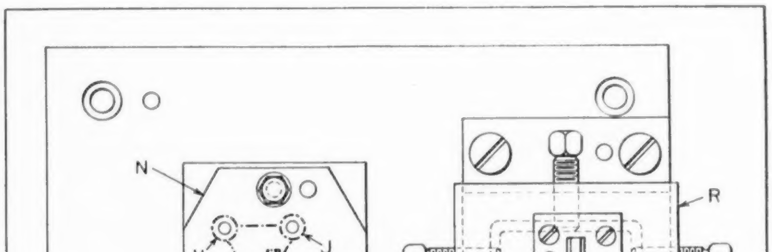


Fig. 4. Fixture for Profile-milling on Two Sides of Work

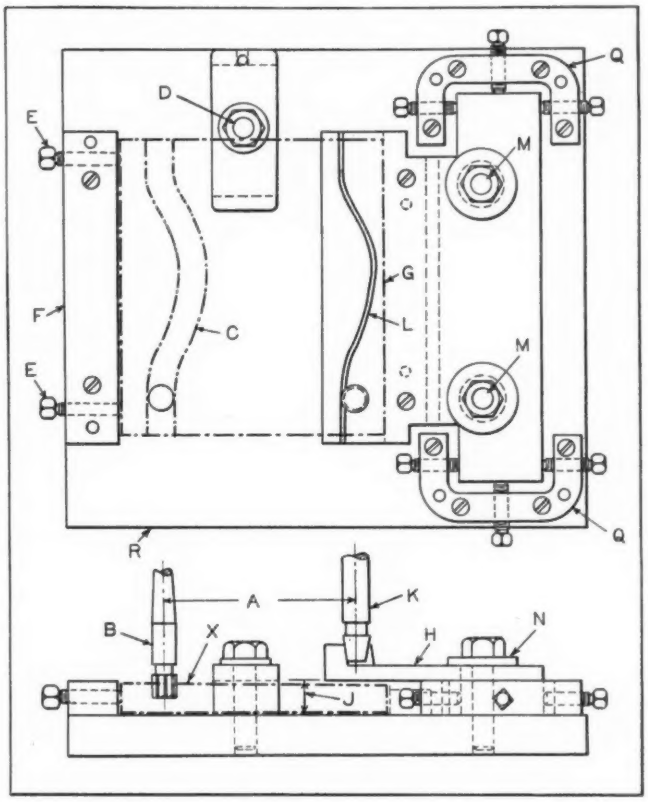


Fig. 5. Profile Milling Fixture Designed for Use when Width of Work Exceeds Center Distance between the Cutter and Guide Pin

times exceeds the center distance between the cutter and the guide pin. In such cases, the work can be handled on a fixture of the "step up" type, as shown in Fig. 5. Here the width of the work *X* exceeds the center distance *A*. The machining operation consists of milling the cam groove *C* with the cutter *B*. A clamp with a screw located at *D* holds the work down, while two screws *E* contained in block *F* force the work against a locating block at *G*.

The forming plate is indicated at *H*. This plate is stepped up or raised to give a clearance space *J*, so that the work will pass under it. In this case, the guide pin *K* must be shorter than the cutter. The profiling is carried on in the usual manner by having the pin travel along the irregular cam surface *L* of the forming block. Two screws *M* are used to clamp the forming block in place, large collars *N* being placed under the screw-heads to cover the holes in the forming block which are made large enough to permit adjusting the block by means of the screws in blocks *Q*.

In using this fixture, the operator slides the work *X* under member *H* from the front of the fixture until it is located against screw *D*. The work is then clamped by screws *E*, after which the groove *C* is cut, using the power feed for traversing the work from the front to the back. By turning the handle controlling the transverse feed, contact is maintained between the guide pin *K* and the forming block *H*.

Preventing Waste in Industry

In a paper read before a recent meeting of the American Gear Manufacturers' Association, T. H. Owens, of the Westinghouse Electric & Mfg. Co., laid down the following rules for preventing waste in industrial operations. By following these principles, the Westinghouse Co. has greatly reduced preventable waste and saved appreciable amounts of money that otherwise would have been completely wasted.

1. Analyze the scrap and refuse accumulations, and trace the materials back to their source.

2. Develop a consciousness of waste on the part of everyone, and make it understood that its cost is borne by *all* employes as well as by stockholders.

3. Provide an incentive for encouraging employes to be alert to possibilities of savings on everything they do, and on materials and tools with which they work. Consider the suggestion systems by which direct awards are made for worthwhile savings suggested by employes.

4. Consider the patrol method for detecting leaks in pipe and hose lines, valves and spigots, gas burning needlessly, lights left on when unnecessary, machines operating idly, etc. Leaks in compressed air lines and valves can readily be detected when machinery is idle at noon time.

5. Make known to all employes the cost of materials and tools. If it is known that an article is worth $5, it will be handled with more care than if it cost only 50 cents. This can be done by means of bulletin boards and posters showing the cost per piece, pound, etc. The scrap value should also be shown.

6. Purchase materials in such lengths and widths as will leave the smallest possible amount of scrap. Mill ends and trim from rods, bars, and sheets are useless, and their scrap value is but a fraction of the cost of the new material.

7. Purchase materials in sufficient quantities to obtain the lowest possible prices; but too much stock should not be kept on hand. Not many years ago enough stock was kept to last for several months; but many concerns now get along on as little as one month's supply. This is very important, because changes in design sometimes occur with little advance notice. The same consideration should be given purchased or manufactured parts and finished products.

8. Inspect all machines, tools, and equipment periodically. Accidents are responsible for a large part of the waste bill, many of them being caused by using damaged tools and worn ropes, slings, and chains. Unguarded machines or the operation of machines without the guards provided for them is the cause of many accidents, and the same is true of unlabeled chemical conductors and containers, unguarded steam lines, and electrical circuits which are not properly safeguarded. No installation should be made or changed without providing for safety. Accidents are preventable, but they do happen if the proper precautions are not taken.

Engineering News Flashes

The World Over

Making 1200 Pictures a Second

High-speed motion pictures, taking 1200 exposures a second, are being used to reveal the action taking place in flash welding, as described in a paper recently presented before the American Welding Society. It has always been a matter of doubt exactly what happens in a flash-welding operation. Pictures taken at the high speed mentioned, however, show clearly what takes place. Scientific information of great importance is expected to be obtained in this way.

Air-Acetylene Flame Used in Splicing Belting

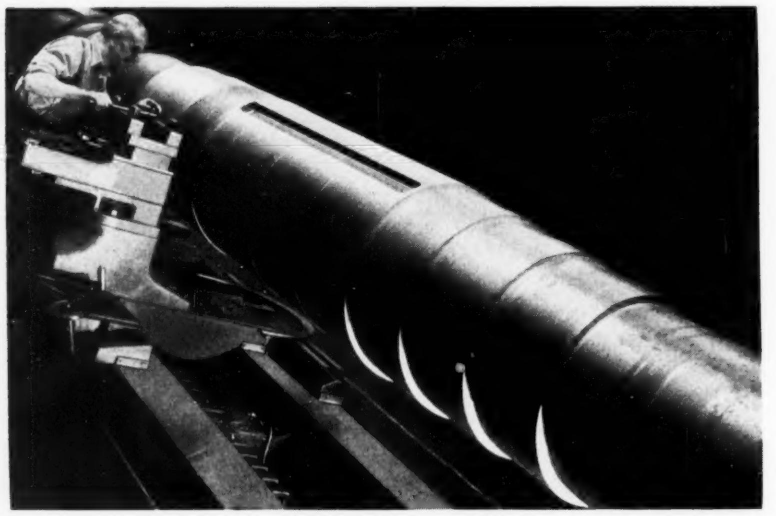
Attention is called in *Oxy-Acetylene Tips* to the use of the air-acetylene flame in the splicing of rubber power belting—a method that has recently been developed. The air-acetylene flame introduces a carefully controlled intense source of heat which is used after the belt has been prepared for splicing in the usual manner and cement applied to it. When the two pieces of belting have been joined, preferably in a press to make the joint perfectly flat and even, the torch flame is applied. The entire lap joint is thoroughly heated by a rapid movement of the torch flame over the surface. In the case of 8-inch belting, the torch is used for approximately five minutes. The action of the heat makes the cement permeate into all the crevices of the fabric, thus creating a firm bond. Immediately after the heating, the spliced section is placed in a press for a few minutes until the belt is reasonably cool. For an 8-inch belt, about five minutes time in the press is sufficient.

Monel Metal Flexible Hose

A hose strong enough to support more than 7000 pounds of weight without collapsing has recently been developed. Made of Monel metal, this hose is said to be the first that combines a pliancy similar to that of rubber with the strength and durability of metal.

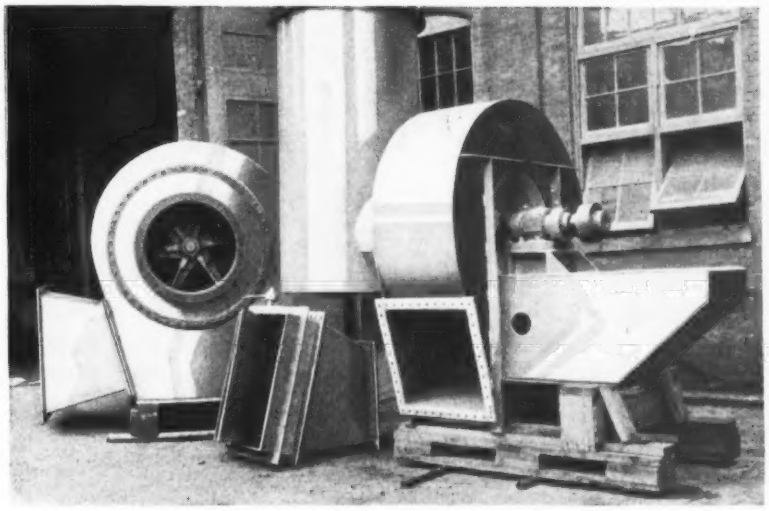
Even Wheelbarrows are Being Improved

Even the lowly wheelbarrow is now receiving the attention of efficiency engineers. Cost of haulage by this primitive but common method is said to be one of the highest among all types of transportation, ranging from $2.40 to $3.20 per ton-mile, in accordance with the prevailing pay for unskilled labor. A manufacturer has found that, by using a special alloy of nickel and aluminum, he can make a wheelbarrow that is as durable as the old type, but so much lighter in weight that its "pay load" can be increased by 15 per cent. Thus the barrow joins the ranks of airplanes, streamline trains, light-weight freight cars, and mine skips in reducing dead weight by the use of strong, corrosion resisting alloys.



Machining a 24-ton Shaft 23 1/2 Feet Long by 30 Inches in Diameter, at the East Pittsburgh Shops of the Westinghouse Electric & Mfg. Co. The Shaft is Used for a 7000-H. P. Reversing Mill Motor

Acid - proof Rubber Covering Applied to Exhaust Fan by a Process Recently Developed by Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc. The Rubber is Firmly Held to the Metal



Acid-Proof Rubber Covering Applied to Large Exhaust Fan

The practicability of utilizing acid-proof rubber covering to eliminate destructive corrosion is exemplified in the accompanying illustration, which shows a large exhaust fan recently rubber-covered by the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. This covering is made of a new acid-proof rubber compound applied by a recently developed process to the metal surfaces of the fan unit. The new process unites the rubber with the metal in such a manner that the rubber covering is held tenaciously in place after vulcanization. As a matter of fact, the covering cannot be removed without completely tearing or destroying it.

World's Longest Streamline Train

The longest streamline train in the world, a light-weight stainless-steel train, has just been placed in operation by the Burlington Railroad between Chicago and Denver. The train consists of twelve cars, including Pullman sleepers, lounge car, dining car, observation car, coaches, and mail and baggage car. It is pulled by two large Diesel power cars totaling 3000 horsepower. Among the innovations on this train may be mentioned telephone service between the lounge car, dining car, and observation car; individual radios in every drawing room, bedroom, and compartment; individual air-conditioning control in the same rooms and compartments; air curtain in the dining car to eliminate all kitchen odors; special long berths for tall passengers; and electric outlets in all washrooms, drawing rooms, bedrooms, and compartments for electric razors, pads, curling irons, etc. The total length of the train is close to 900 feet. Each of the passenger cars is 2 1/4 inches wider inside than ordinary railroad equipment.

Contributing to the service flexibility of the new trains is the fact that they are not completely articulated, but instead, a "tight-lock" coupler is used between some of the cars, giving to a great degree the benefits of an articulated truck, but making it possible to cut in and take out cars when occasion requires.

The By-Products of Coke Ovens Assume Increasing Importance

A $3,000,000 coke oven plant—the largest in Great Britain—has just been put into operation by Dorman, Long & Co., Ltd., of Middlesborough. As by-products, this coke plant will produce, weekly, 200 tons of sulphate of ammonia, 800 tons of crude tar, and 70,000 gallons of crude benzol. These and some other by-products also form the basis of lacquers, perfumes, aspirin, fertilizers, motor spirit, violet oil for hairdressing, and vanilla flavoring. The chemist has found almost unbelievable ways to extract unexpected products out of coal.

Newly Developed Degreasing Equipment

Originally developed for removing heavy accumulations of oil and grease from airplane engines and parts, the Hydro-Degreaser, offered to the trade by the Curran Corporation, Malden, Mass., has been found well adapted for economical operation in large industrial plants and screw machine works. The cleaning medium in this degreaser, known by the trade name "Gunk," will remove completely oil and grease, as well as wax and buffing compounds, without injury to aluminum, magnesium, or other soft metals.

Oil-coated and greasy metal parts are simply immersed in a cold solution of Gunk, contained in one compartment of the Hydro-Degreaser. After soaking for a few minutes, the parts are removed and placed in the rinsing section of the degreaser, where they are rinsed by means of a water hose. The water quickly emulsifies the treated grease, leaving a clean dry surface without an oily film.

EDITORIAL COMMENT

Ability and Training Must Remain Test of Fitness for Leadership

In these days, when many erroneous ideas are broadcast for propaganda purposes, irrespective of the facts on which they are based, it is of particular value to quote some specific facts indicating that the opportunities for the average man in American life are very largely the same as they have been in the past. The *Link-Belt News* calls attention to the fact that among the 176 executives who are today responsible for the management of 95 per cent of the present capacity of the steel industry, about nine out of ten have risen from humble positions to their place of leadership. Of the 176 executives, 154 have risen from the ranks—84 began as laborers, 26 as clerks and stenographers, 19 as messengers, and 25 as engineers or chemists.

Of 140 railroad presidents in the country, more than 100 came up from the rank and file; one-half of the bank presidents in New York City came from the Middle West and from the farms.

The management of America's business today is still largely in the hands of men who came from every walk of life—men who have risen simply by their ability to do the work required of them and to assume the responsibility offered to them. This is an American tradition that is well worth preserving, and any influences to the contrary should be resisted by anyone who has the best interests of America's future at heart. It will be a sad day for American industry and for the American people if the management of its business drifts into the hands of untrained political officeholders.

To Make a Patented Article for Own Use is Infringement

An engineer experienced in patent matters, having read in June MACHINERY the article "Repairing Patented Machines," writes us calling attention to a misunderstanding of patent rights that is quite prevalent in industry. There are many manufacturers, engineers, and mechanics who think that so long as a patented machine or device is built for use in one's own shop or for one's own private purposes only, and not sold to the trade, there is no patent infringement. This, of course, is entirely erroneous. It is just as much of an infringement on a patent to build a patented machine or device for one's own use as it is to build one for sale. The patentee of any machine or device has an absolute monopoly as regards both the manufacture and the use of his invention, and no one else can use it except by the express permission of the patentee. The erroneous belief that a patented article can be made for one's own use has frequently proved very costly.

This is just one of the many points concerning patents where general impressions about the patent law may lead one astray. When in doubt, it is safest to consult a patent authority.

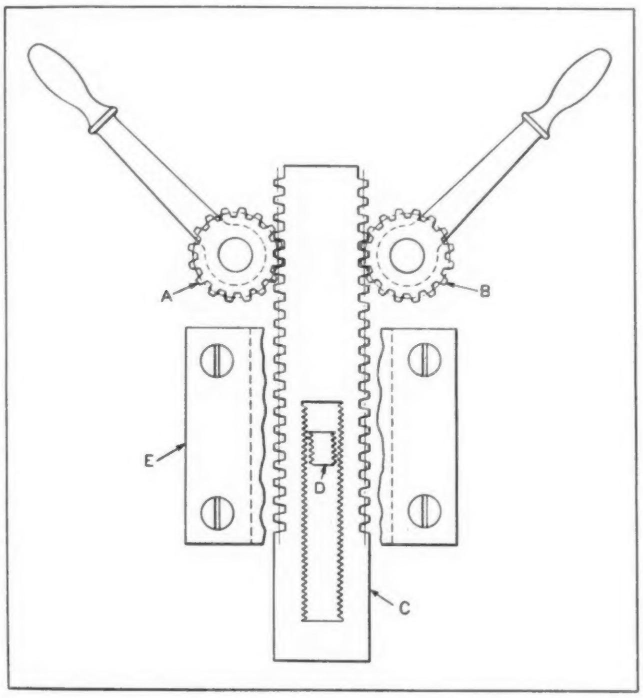
Both Wage-Earner and Investor are Robbed by Excessive Taxes

In connection with the editorial that appeared on page 714 of July MACHINERY, "Methods of Taxation Can Make or Break Industry," an extensive investigation made by the National Association of Manufacturers, based on a survey of 694 companies in twenty-five leading industries, becomes of especial significance. This investigation shows that for every $1 paid in wages, 34 cents is paid by industry directly in taxes. Unfortunately, there are no statistics to show how much of the dollar received by the wage earner *also* goes for taxes, direct and indirect; but we know that it is a very substantial amount, considering that almost everything that is bought is subject to some kind of tax, and in many cases a multiplicity of taxes.

The survey further shows that for each $1 paid in dividends, these 694 companies paid $1.42 in taxes. The old proverb about killing the goose that lays the golden egg still finds application. American industry has provided for the American people the highest average standard of living in the world. Can industry continue to maintain that standard if it is throttled by excessive taxation? It is said that there are one or two countries in Europe where the standard of living is beginning to equal that of the United States. Unwise measures of taxation may leave us behind; yet we have all the resources required to head the procession of progress.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices



Mechanism Designed to Insure Synchronous Movement of Two Levers Under Equal Torque

Mechanism for Insuring Synchronous Motion

By L. KASPER

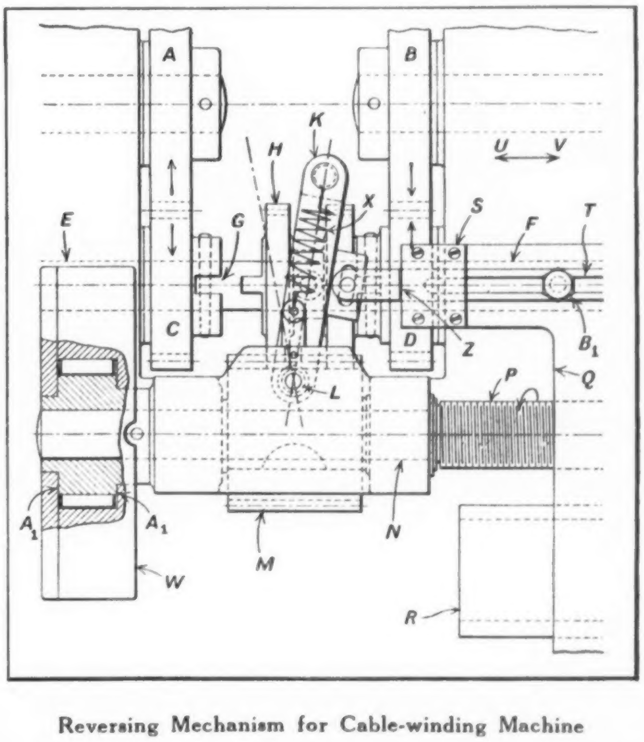
On a machine for fabricating a wire product, two shafts, operated by means of hand-levers, actuate a tension mechanism. The shafts are required to operate practically in unison, a narrow range of latitude being allowed. Gearing the shafts together appeared to be the solution, but this method proved unsatisfactory, as at times, one shaft was driven by the other, resulting in torsional stresses, which were objectionable. In order to insure equal power application and synchronous movement of the two shafts, the arrangement shown in the illustration was devised.

The two gears *A* and *B* are carried on the shafts and mesh with the double rack *C*, which floats between them. Rack *C* carries a serrated slot at its lower end. A serrated pin *D*, fastened in a stationary part of the machine, is located in the slot of rack *C*. Pin *D* is given a minimum amount of clearance in the slot, the clearance being shown somewhat exaggerated. The plate *E*, which serves as a guide for rack *C*, is broken away to show the pin *D*.

In operation, if either of the handles is moved ahead of the other, the action of the gear on that shaft causes the rack *C* to swing on the teeth of the other gear as a fulcrum, so that the serrations in the slot of the rack engage the serrations on pin *D*, thus preventing further movement until the other handle is given a corresponding movement.

Reversing Mechanism for Cable-Winding Machine

An automatic reversing mechanism for a cable-winding machine which is designed to allow reversal of the winding guide at any desired point from zero to maximum, so that reels of various widths can be wound on the same machine, is



Reversing Mechanism for Cable-winding Machine

shown in the accompanying illustration. The winding of various pitches is accomplished by using pick-off gears. An interesting feature of this mechanism is the use of two free-wheeling flywheels to store up energy for completing the automatic clutch-engaging movements at each reversal of the lead-screw *P* which drives the winding guide.

The mechanism is driven by the gears *A* and *B*, which rotate in opposite directions. These gears mate with gears *C* and *D*, which are pinned to the shafts *E* and *F*, formed with clutch slots *G*. For simplicity, only one slot is shown, but the clutches are of the usual multi-tooth type.

A combination gear and spool *H* runs freely on shafts *E* and *F*. The spool is shifted from side to side by the pins in the fork *K*, which is pivoted at *L*. It should be noted that the spool *H* remains constantly in mesh with the gear *M*, which is keyed to the shaft *N*. This shaft is formed integral with the lead-screw *P* which actuates the winding-guide casting *Q*. The casting *Q* is guided by the way *R*. The guide head carries the member *S* in which slides the slotted rod *T*. This rod is connected to the fork *K* as indicated. On the end of shaft *N* a free-wheeling flywheel *W* is pinned, which locks when the lead-screw rotates in the direction indicated, but unlocks in the opposite direction and runs free. On the other end of shaft *N* a second free-wheeling flywheel is pinned, which operates in the opposite way to *W*. Spring *X* keeps the clutch in mesh with gear *C* or *D* until acted on by fork *K*.

In operation, spool *H*, being in mesh with gear *D*, causes lead-screw *P* to operate in the direction shown. This causes guide *Q* to move in the direction *U* until it comes in contact with the shoulder *Z* on rod *T*. The guide then pushes fork *K*, causing the spool to move out of the clutch slot until it is entirely disengaged. At this point lead-screw *P* would normally stop revolving. However, the energy stored in the free-wheeling flywheel *W* continues to turn the lead-screw until fork *K* passes through and slightly beyond the dead center position, whereupon spring *X* causes the spool to snap over against the face of gear *C* and into the slot. At this instant, the lead-screw reverses and flywheel *W* commences to free-wheel, while the opposite flywheel is driven to store up energy for the next reversal. It was found necessary after a trial run to make the surfaces A_1 in the free-wheeling flywheel a friction fit, so that after a short interval the energy would be dissipated, and it would then tend to drop down to a speed below that of the shaft. Thus, when again actuated, it could immediately pick up in the proper direction.

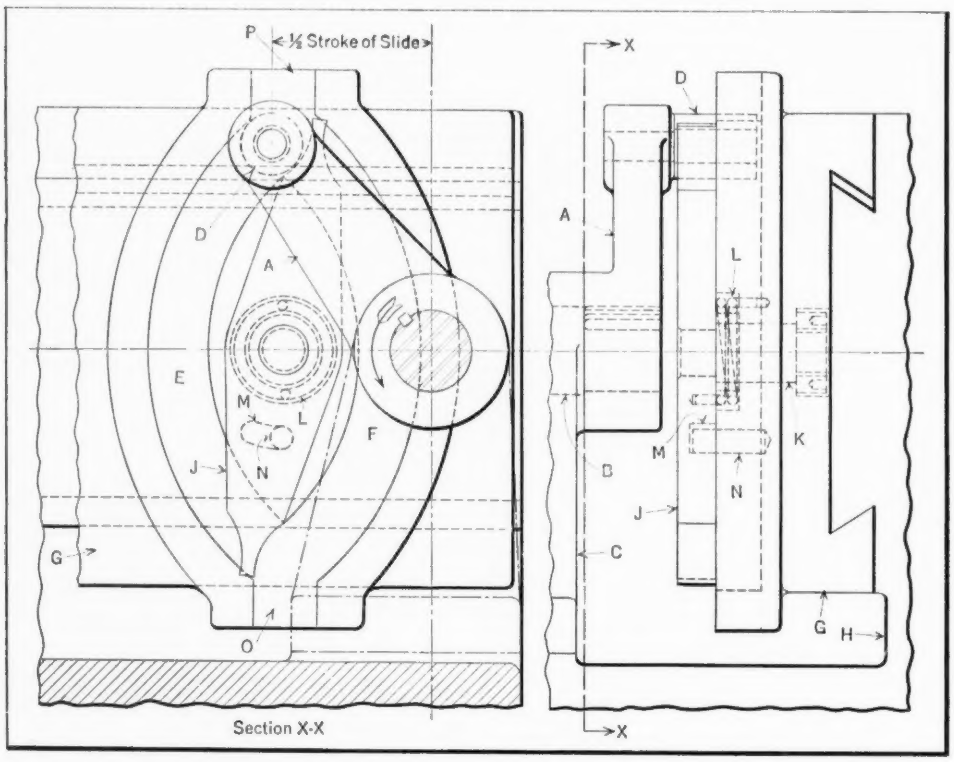
Upon the reversal of the lead-screw, guide *Q* travels in the direction *V* until member *S* strikes the stop B_1, when reversal again occurs.

J. A. H.

Positive Crank Motion that Causes Slide to Dwell at Both Points of Reversal

By J. E. FENNO

The use of a cam of ungainly size was avoided in the design of a wire-forming machine by employing a rather ingenious crank motion that produces a dwell at each end of its stroke. The mechanism employed is shown in the illustration. It imparts a relatively long stroke (6 inches) to a slide, and produces a dwell at each end of the stroke. The movement is positive and smooth. The compact nature and simplicity of the design may suggest its application to other types of machines requiring a similar movement.



Crank Motion that Reciprocates Slide, Allowing Dwell at Each Point of Reversal

The crank indicated at *A* is mounted on the drive shaft *B*, the latter being supported in the stationary bearing *C*. A roll *D* engages the two grooves *E* and *F* in the driven slide *G*, which is mounted on the machine frame *H*. Positive action of the roll in passing from one groove to the other is assured by the switching arm *J*. This

arm is secured to stud K, which is a free turning fit in the slide. It will be noted that the face of the roll is long enough to engage both the groove and the arm. Normally, the arm is held in the position shown by the torsion spring L, which forces the right-hand end of the elongated slot M in the arm against the pin N in the slide.

As the crank moves in the direction indicated by the arrow, the roll is guided by the arm into groove E. Since this groove is concentric with the crankshaft, no motion of the slide will result, and consequently, the slide will have the required dwell at this end of the stroke. When the roll reaches the lower end of this groove, however, it pushes the arm J around in a counter-clockwise direction until the left-hand end of slot M engages pin N. In this way, the lower end of the arm forms a part of a continuous groove leading from groove E into the vertical groove O; and as the crank continues to rotate, the slide is carried toward the right to the end of its stroke. At the middle of this stroke, the roll is at its lowest position, at which time the lower end of the arm clears the roll. This allows the spring L to force the arm back to the normal position shown, so that a continuous groove leading from groove O to groove F results.

When the slide has reached the end of its stroke toward the right, the roll enters the concentric groove F, allowing the slide to dwell until the roll reaches the top of this groove. At this point, the roll engages the arm, forcing its upper end toward the left, so that it serves as a guide for transferring the roll to the vertical groove P. Continued rotation of the crank causes the slide to move toward the left to the position shown, the switching action of the arm being identical to that which took place at the bottom of the slide when the roll entered and left groove O.

It is possible that this mechanism would operate without the switching arm, but the action would not be certain. That is, the roll would be likely to jam at either point of reversal should the slide be accidentally displaced. Moreover, the impact of the roll, at each point of reversal against one corner of each of the grooves O and P would certainly damage the face of the roll or the groove corner. In addition to these disadvantages, a jerky action would be obtained at the points of reversal, which is absent when the switching arm is used.

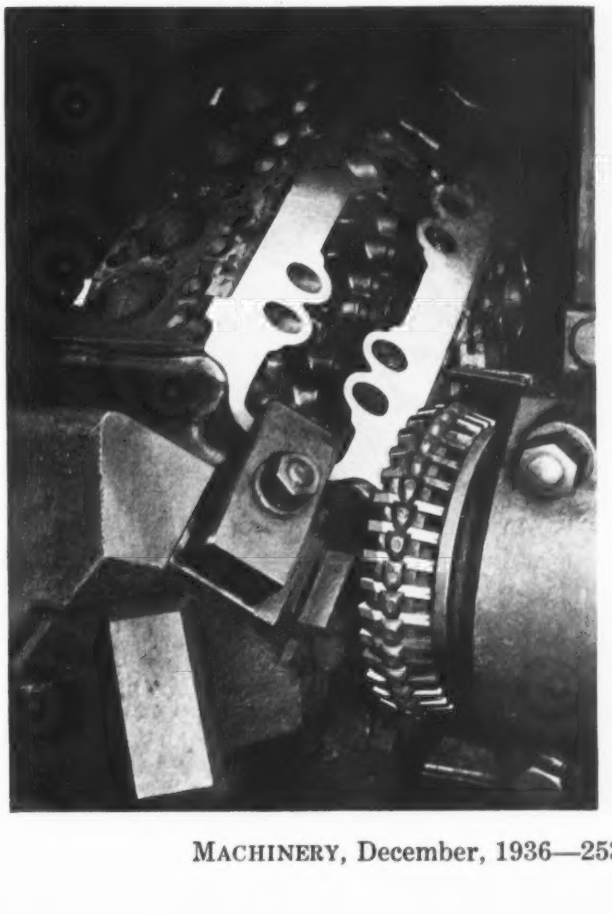
Steady Improvement in Business

It is encouraging to note the steady upward trend of business. The General Electric Co. announces that orders received during the third quarter of 1936 amounted to very close to $75,000,000, as compared with $54,400,000 during the third quarter of 1935, an increase of 38 per cent. Orders received during the first nine months of the year amounted to approximately $212,000,000, as compared with $159,000,000 during the same period last year, an increase of 33 per cent. It should further be noted that the orders received during the third quarter and during the first nine months of this year were larger than for any corresponding period since the year 1930.

* * *

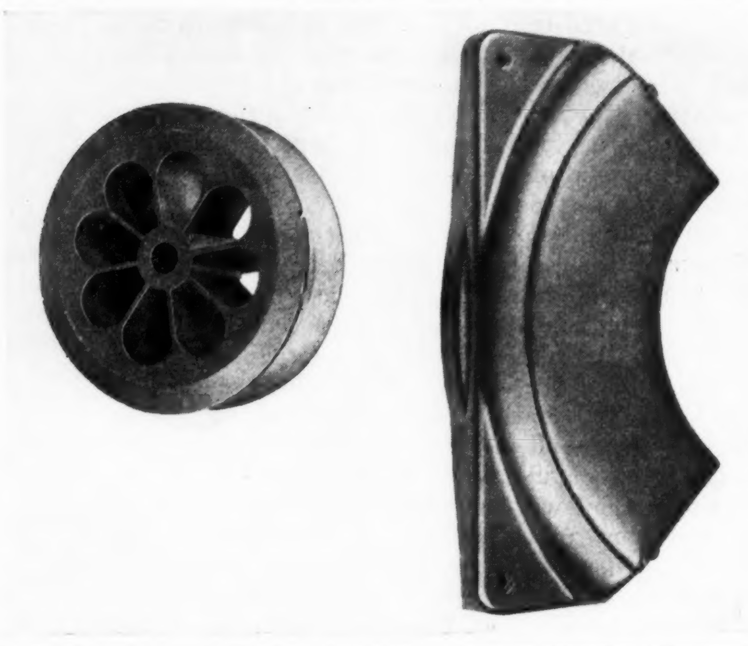
Awards for Industrial Application of Synthetic Plastics

In a competition relating to uses of plastic materials, sponsored by *Modern Plastics*, the first prize winner in the industrial group was the Toledo Scale Co., Toledo, Ohio, the award being for the Plaskon housing of the company's new scale. The second award went to the Burton Mfg. Co., Chicago, Ill., for its X-ray projector housed in a Bakelite molding. The third award went to the Colonial Radio Corporation, Buffalo, N. Y., for a dial lens bezel of Tenite.



The "Bank" Surfaces of Ford Cylinder Blocks are Rough- and Finish-milled with Tools of Stellite J-Metal. In Both Operations, the Cutting Speed is 100 Feet a Minute and the Feed is 0.703 Inch. In Roughing, the Depth of Cut is 0.120 Inch, and in Finishing, 0.015 Inch

Dies for Magnesium Die-Castings



By CHARLES O. HERB

Fig. 1. Die-castings Made from a Magnesium Alloy that is Approximately One-third Lighter than Aluminum

MAGNESIUM is becoming increasingly popular for use where maximum lightness is important in a metal. It is approximately one-third lighter than aluminum, and in the cast condition has a tensile strength comparable to that of aluminum. For instance, non-heat-treated castings of Dowmetal (a magnesium alloy) have a tensile strength of 28,000 pounds per square inch, while heat-treated Dowmetal castings have a tensile strength of 35,000 pounds per square inch.

Two die-castings of Dowmetal are shown in Fig. 1. The example at the left is a reel on which wire only 0.0003 inch in diameter is wound. Sand castings of aluminum were formerly used in this application. They collapsed due to the weight of the wire revolving at high speed, but the magnesium die-castings stand up satisfactorily under this service. These reels have a maximum diameter of 5 1/8 inches and they are 1 7/8 inches wide.

The typewriter top plate shown at the right is about 11 inches long by 5 inches maximum width. Its thickness varies between 3/32 and 1/16 inch.

Dies for Magnesium Castings Must Receive Extensive Water Cooling

Both of the magnesium die-castings illustrated are produced in automatic machines built by the Madison-Kipp Corporation, Madison, Wis. In the die-casting operation, the melting pot of these machines is held at a temperature of 1350 degrees F. Such a high temperature necessitates careful provision for constant cooling of the dies by means of water. Both sets of dies were made entirely from a high grade of tool steel.

In Fig. 2 may be seen the precautions taken to insure that the temperature of the dies used in producing the reel will not become excessive. Holes *X* are provided in the two slides *A* and *B* of the movable die that form the cylindrical surface of the reel. These slides open sidewise when the movable die is withdrawn endwise from the stationary die. Holes *Y* are drilled in block *C* of the movable die, in back of the two sidewise operated slides. Holes *Z* extend completely across the bottom of the stationary and movable dies in the vicinity of the sprue, while similar holes are provided around block *D* of the stationary die.

Eight Radial Cores Made Integral with One Block

The eight radial openings of the reel are produced by integral cores of block *D*, which extend into the die cavity, as indicated by the letters *W*. The shape of these cores will be understood from the photograph of the reel reproduced in Fig. 1. Each core extends about 2 inches above the block proper and it tapers from 1/32 to 3/64 inch from top to bottom. The space between the walls of the successive cores varies from 1/16 to about 1/8 inch in width.

The central hole in the reel is formed by a core of the movable die, while the hub is formed by the space between this central core and the eight cores *W* of block *D*. The two flanges of the reel are produced by depressions in blocks *C* and *F*.

How the Part is Ejected from the Dies

When the movable die is withdrawn from the stationary member, the casting is held to the movable die by slides *A* and *B*, which pull the casting from cores *W*. As the movable die recedes, rollers attached to crank-arms *H* follow cam paths on bars mounted on top of the machine and turn these crank-arms, as well as shafts *J* to which they are

fastened. Shafts J have spur gear teeth for the greater part of their length, which engage rack teeth cut on the back of slides A and B. Thus, as the crank-arms are swiveled on their axes, slides A and B are opened sidewise.

During the last two inches of the opening stroke of the movable die, plate K is held stationary. This causes a series of long slender pins attached to the plate to force the casting off the central core and out of the die cavity. Plate K, with its ejecting pins, as well as slides A and B, are returned to the positions shown when the movable die is again closed against the stationary member.

* * *

Electric Arc-Welding Machine Standards

The National Electrical Manufacturers Association, 155 E. 44th St., New York City, has announced the publication of the NEMA Electric Arc-Welding Machine Standards. The new publication is a reference work of practical information concerning the manufacture, testing, and performance of direct- and alternating-current arc-welding machines, such as motor-generator sets, dynamometers, transformers, and rectifier arc-welding units. The book will aid in clearing up troublesome problems for the buyer of welding equipment, and defines numerous terms that have hitherto been subject to various interpretations, thus causing confusion.

Efficiently Managed Industries Benefit Everybody

Every thinking person will agree that property serves the public best when most efficiently managed. Industrial plants are inanimate things of steel, brick, stone, and machinery. Their value to the public is in proportion to how profitably they can be operated. In the hands of a group of efficient managers, a plant may be worth millions of dollars to the community and the nation. In the hands of a group of inefficient managers, a plant is a liability. I am in hearty accord with laws that penalize those who do not honestly fulfill their trust to the public, but legislation that interferes with the efficiency of honest management is against the public interest.

What do I mean when I say that property serves the public best when best managed? Take, for example, the great automotive plants. If through ingenuity and good management, the automobile industry is able to produce an improved car for \$50 less than last year, it has performed a constructive service to the public. This means that millions of citizens whose incomes did not formerly permit the purchase of a new car may now enjoy one. And this enlarged group of purchasers will make more work for the employes of the automobile industry and of the industries that supply it with raw materials. In turn, it will result in a reasonable return to the stockholders, who will also be in the market for new cars.—*Charles R. Hook, President, American Rolling Mill Co.*

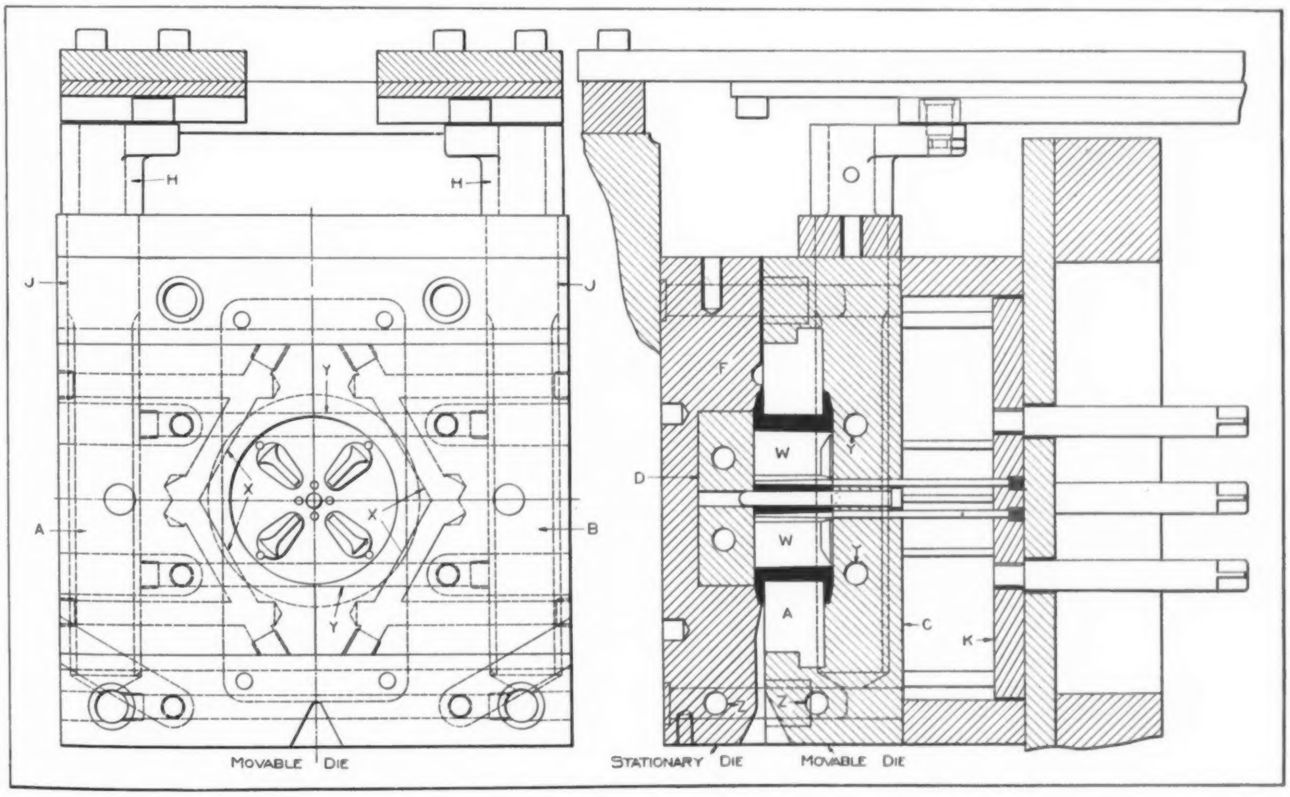


Fig. 2. Dies that Produce the Magnesium Reel Shown at the Left in Fig. 1. Extensive Provisions for Water Cooling are a Feature of These Dies, Necessitated by the High Casting Temperature of Magnesium

Drilling Evenly Spaced Holes 0.010 Inch in Diameter in an Atomizer Nozzle

By H. E. SMITH
Foreman, Tool Manufacturing Department
Westinghouse Electric & Mfg. Co.
South Philadelphia, Pa.

ONE of the most vital parts of a Diesel engine is the atomizer nozzle, which breaks up the stream of fuel oil into a spray that is fine enough to permit the entire fuel charge to be burned cleanly during the power stroke. Great accuracy is essential in drilling the spray holes, which must be smooth, as well as true to size.

When it is considered that the diameter of these spray holes is 0.010 inch and that the material of the nozzle must be tough enough to withstand the erosive action of fuel oil under very high pressure, some of the difficulties to be overcome in drilling the holes will be understood.

Much experimental work was carried out and many troubles were experienced before the following method of drilling the spray holes was fully developed. This method, which is employed by the Westinghouse Electric & Mfg. Co., in the construction of Diesel engines for rail applications, has proved highly satisfactory for drilling holes from 0.005 to 0.0145 inch in diameter.

The fixture, shown in Fig. 1, consists of a stud *A* for holding the nozzle, an index-plate *B* on which stud *A* is mounted, and a plate *C*, which is set to the desired angle. To the side of the angle-plate is attached a leaf *D*, which is hinged so that it can be swung out of the way.

The fixture is clamped to the table of a Fosdick Superspeed sensitive drill press which has a speed range of from 5800 to 11,500 revolutions per minute. Owing to the toughness of the material used in the nozzles, the lower speed has been found most suitable. Pivot drills, such as can be purchased at any jeweler's supply house, are used. Turpentine is employed for a cutting lubricant.

The hinged leaf was originally designed to hold a drill bushing, but it was found that this arrangement would not give the desired accuracy, and also prevented proper observation of the work by the operator while drilling. The latter feature is essential in drilling holes of such small diameter, as there is practically no "feel" to the drill, due to

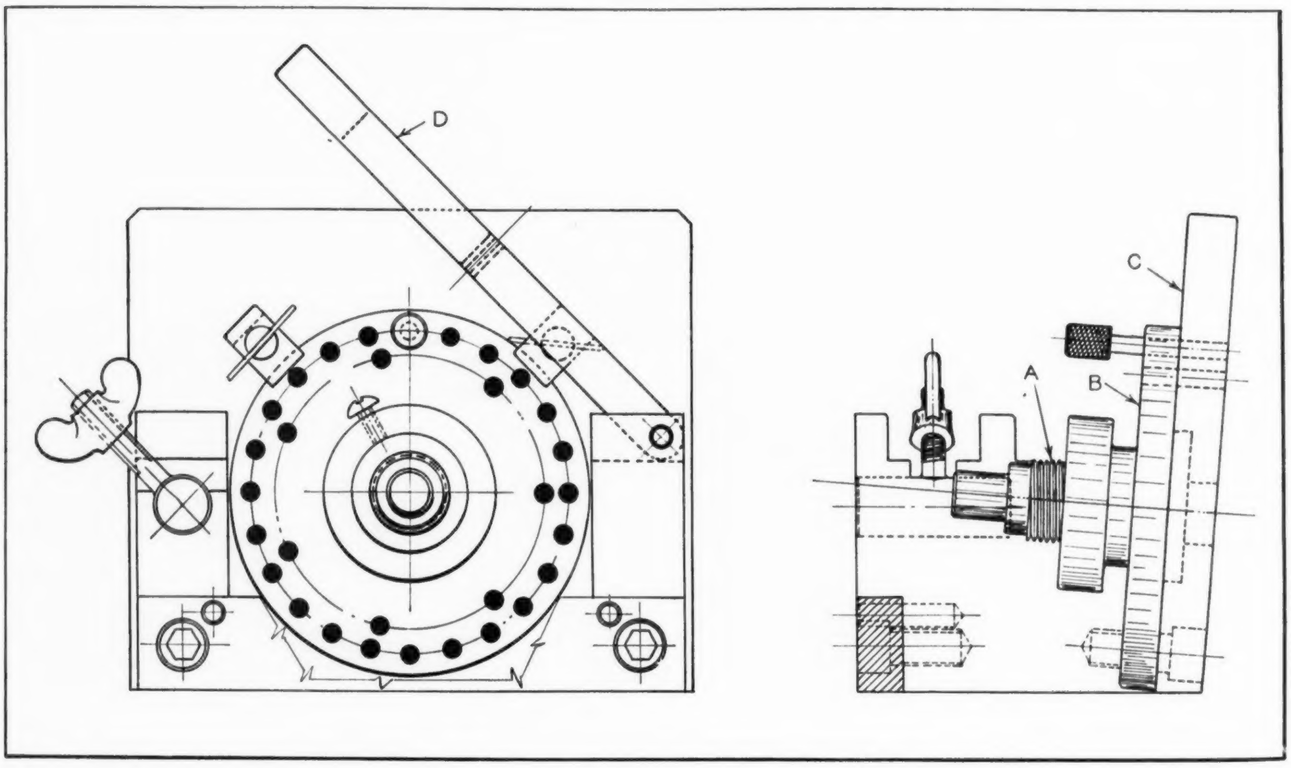


Fig. 1. Indexing Jig Used in Drilling 0.010-inch Holes in Atomizer Nozzle

Fig. 2. Center-punching Holes in Atomizer Nozzle preparatory to Drilling

Fig. 3. Using Special Magnifying Glasses in Drilling 0.010-inch Holes

the lack of resistance. For this reason, the drill must be watched closely to prevent breakage.

The operator is furnished with special magnifying glasses, set in a frame and worn very much the same as an ordinary pair of spectacles, as shown in Fig. 3. These glasses enable him to focus on the drill in operation, with the added advantage of leaving both hands free, and also permit normal vision at will without removing the glasses.

Instead of using the drill bushing as a guide, a small prick-punch, ground concentrically to a point and an accurate fit in the bushing, is used. The locations of the holes in the nozzle are marked by lightly tapping the prick-punch each time the plate is indexed, as in Fig. 2. After this operation is completed, the leaf is swung back, and the holes are drilled. It is possible to drill a seven-hole nozzle in approximately twelve minutes.

* * *

Meeting of Galvanizing Engineers

Executives and operating and technical men of companies producing galvanized sheets met in Pittsburgh, November 18 and 19, to discuss operating problems in the galvanizing departments of their companies and to plan a permanent organization of those engaged in the galvanizing industry. The meeting was sponsored by the American Zinc Institute, 60 E. 42nd St., New York.

Twelfth National Power and Mechanical Engineering Exposition

As this number of MACHINERY goes to press, the twelfth National Exposition of Power and Mechanical Engineering held in the Grand Central Palace, New York City, opens its doors. From November 30 to December 5, three floors of the Grand Central Palace will be covered with the latest products of the mechanical engineering field.

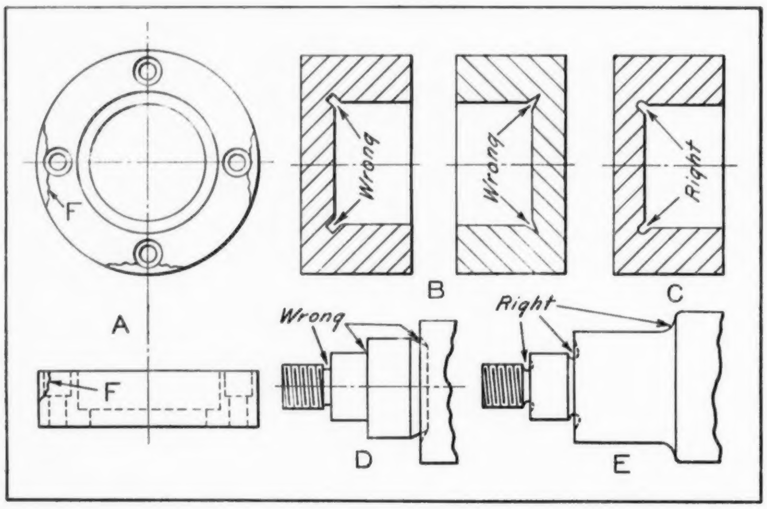
Among other things, the exposition features processes by which many engineering products are made. One company shows a working model of a 79-inch hot strip mill; another reproduces the colorful setting of tapping molten steel from an open-hearth furnace; one exhibitor shows seamless steel boiler tubes made by a new process in which solid billets of steel are formed into seamless tubes by a series of forging actions. Other metal products exhibited include high-strength alloy and carbon steel castings, as well as castings of stainless and heat-resisting alloys. Among the exhibits might also be mentioned metal cutting-off machines, electric rivet heaters, pyrometers, and oil-testing instruments. Since the exposition is particularly devoted to the power side of mechanical engineering, there is obviously a complete line of all kinds of power plant equipment, including combustion controls, boiler room meters and gages, steam calorimeters, portable gas analyzers, valves, and refractories.

Avoiding Breakage in Hardening

By WILLIAM C. BETZ, Equipment Engineer
Fafnir Bearing Co., New Britain, Conn.

It is very important that radii or fillets be provided at corners and shoulders of high-carbon steel parts that are to be hardened. Failure to do this is the cause of much cracking in hardening, especially in the case of water-quenched steels. The corners should be turned or machined to as large radii as possible and should be free from tool marks. Also, they should be filed and polished to be of maximum effectiveness.

In hardening die rings such as shown at *A* in the accompanying illustration, a great source of trouble is cracking through the counterbored holes, as indicated at *F*. This can be avoided to a great extent by slightly rounding off the sharp edges of the counterbore and by keeping the holes as far as possible from the bore or the outer edge of the piece. If a piece has holes bored close to the bore or to the outer edge, it should be held over the quenching tank for a fraction of a minute before quenching. This gives the thin section time to lose heat, while the body loses very little, thus helping to prevent cracking of the thin sections.



Diagrams Showing Correct and Incorrect Methods of Finishing Corners to Prevent Cracking when Hardening

Cracking is also likely to occur in the bottoms of keyways in shafts and bored parts. The corners of all keyways should have a decided round if they are to be water-quenched. In some cases, it is a good plan to grind the keyway in a shaft or spindle from the solid after hardening. If a finished piece must have sharp corners, a radius should be machined in the corners to prevent cracking when hardening. This radius can be ground out to a sharp corner after hardening.

Threads are another hardening hazard. External threads are often ground from the solid at no greater cost than chasing in the soft stage. Threads ground in this manner will be in line with the centers of the work. Internal threads are also ground, but this work is more difficult, and the cost in many cases is prohibitive. Examples of wrong methods of machining "sharp corners" are shown at *B* and *D*, while correct methods are illustrated at *C* and *E*.

* * *

Locating Source of Noise in New Machine

By ADOLPH MOSES

A newly assembled machine often is noisy. To locate the source of the noise is sometimes a tedious procedure, especially if the machine is complicated. When the units of a machine can be run separately, it is much easier to find the cause.

If a machine is so constructed that the units cannot ordinarily be run by themselves, the drives to all but one unit may be disconnected, so that the single units can be run alone. An idler pulley clamped to the machine frame can sometimes be used to advantage. A separate driving source such as a small motor with a belt or flexible shaft may be used to drive the various units. Small machines may be driven with a fractional horsepower motor held in the hand, if a flexible shaft or a deep grooved pulley is used. It is always a good plan to provide some means for loading each unit while it is being run, because mechanisms that are silent when running idle sometimes become noisy under load.

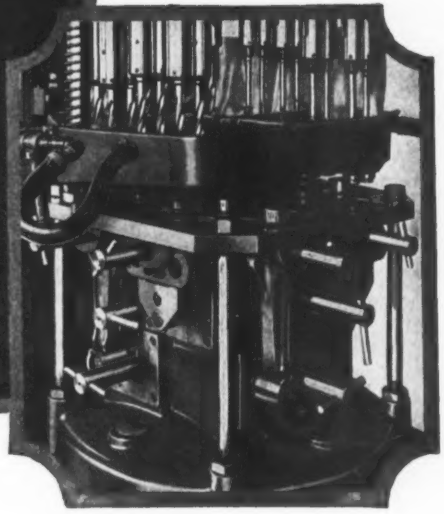
In one case, each unit on a machine operated silently when run by itself, but when all the units were running together they became noisy. The motor also operated silently when running idle. The source of the noise was finally located by taking the belt drive from the motor to an idler pulley on a shaft held in the hands, and putting a light friction load on the idler pulley. The moment the friction load was applied, the motor became noisy. A loose set-screw in the motor pulley which permitted the pulley to vibrate on the motor shaft was the cause of this noisy operation. Sometimes ball bearings operating at high speed produce a sound similar to that produced by gears, if the bearings are adjusted too loosely.

The method of running each unit of a machine separately may seem so obvious that it should hardly be necessary to mention it; yet it often happens that this is overlooked, especially if the machine is not intended to be operated that way.

* * *

Within the last twenty years the tractive effort, or the capacity to pull, of the average steam locomotive has increased 44 per cent.

Design of Tools and Fixtures



Circular Shaving Tool and Holder for Screw Machine

By OCTAVE ANTONIO, Engineering Department
American Broach & Machine Co., Ann Arbor, Mich.

The outstanding difficulties with shaving tools for automatic screw machines have been their lack of adjustment and short life. The tool shown in Fig. 1 differs from other types in that adjustment is provided both in the holder block and in the cutter-head. Also, the cutter is of the circular type which, in practice, has from five to ten times the life of the ordinary flat cutters. Instead of a flat shank, this tool has a round one, secured in the block by one bolt *A*, which operates a round clamp. This permits the roller to be set for proper contact with the work. Tools with shanks of rectangular cross-section are useless, once the shank is sprung or pitted with set-screws, as often happens.

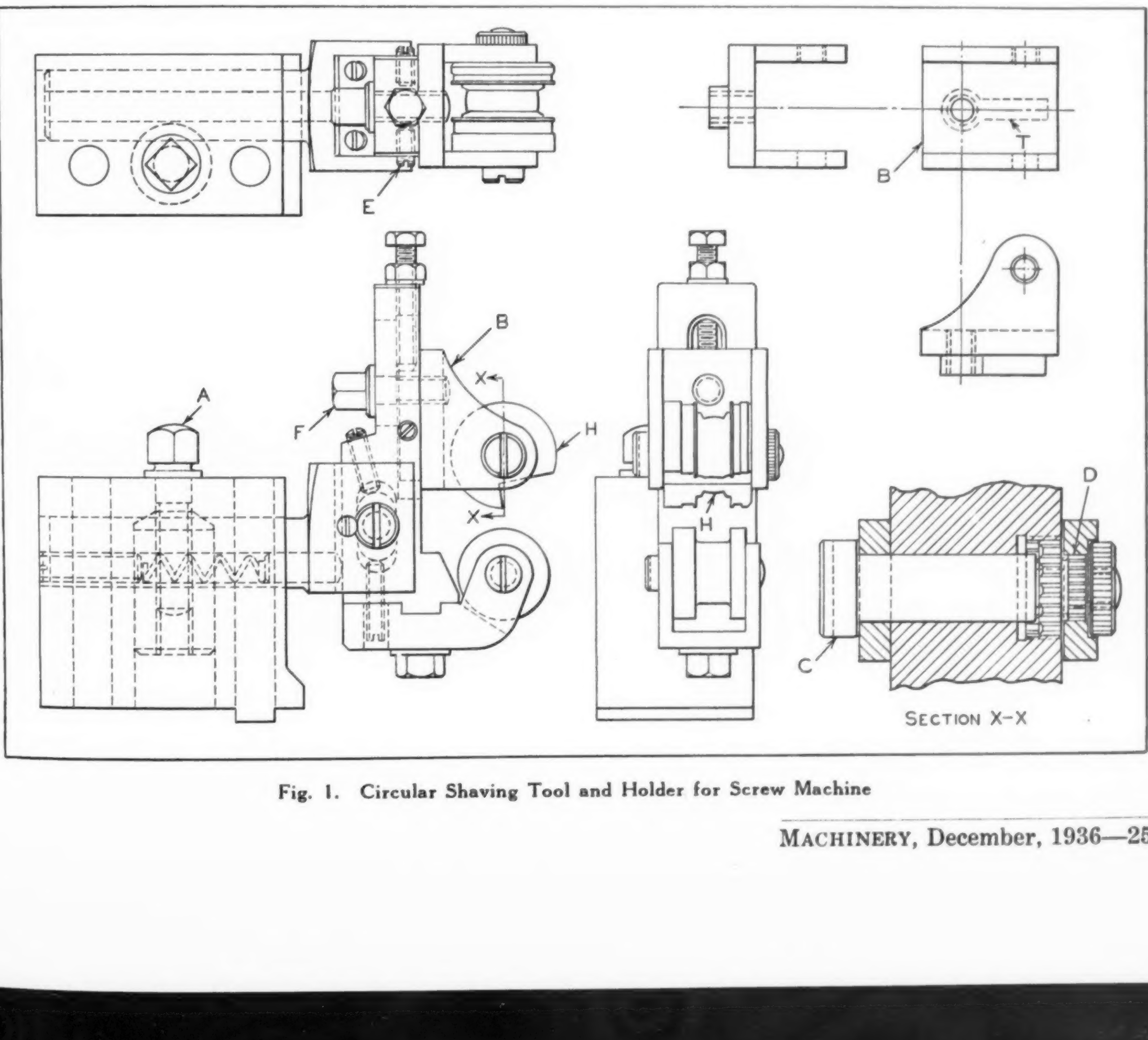


Fig. 1. Circular Shaving Tool and Holder for Screw Machine

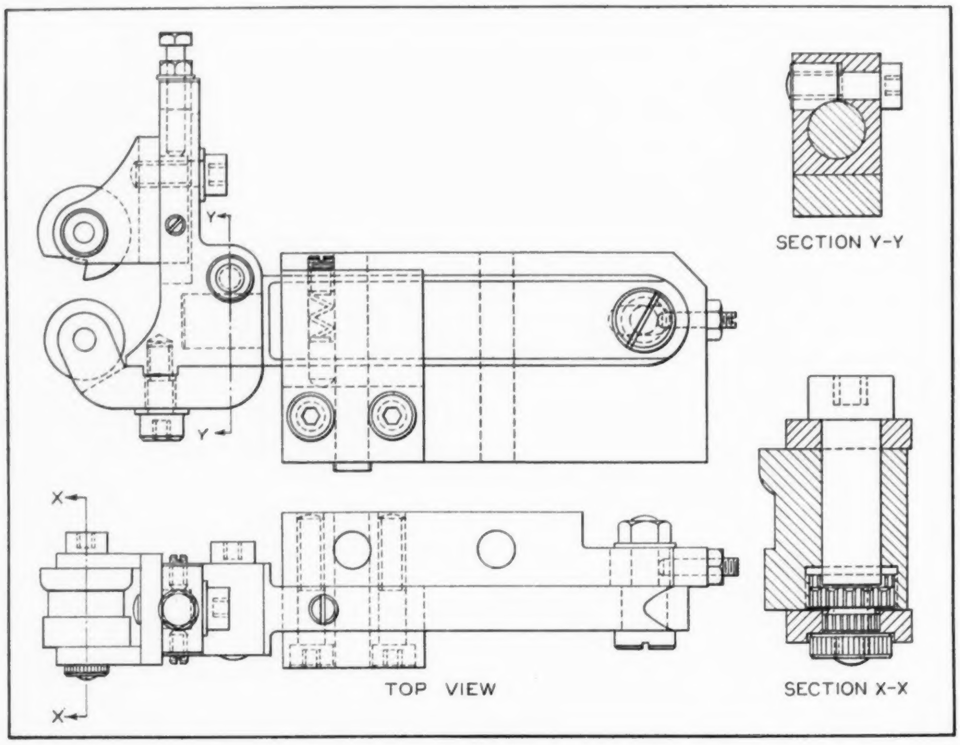


Fig. 2. Tool and Holder Similar to One Shown in Fig. 1

An alternative design of the shank and holding block is shown in Fig. 2, which has the advantage of simplicity, since the hinged shank provides for vertical adjustment of the cutter-head, thus eliminating the necessity for having the front part of the tool adjustable. The cutter-head swivels on the shank for leveling.

Referring to Fig. 1, the cutter bracket *B* has a substantial tongue *T* which enters the vertical groove in the upright. The top of the tongue has a radius concentric with the tapped hole running through it. This part of the tongue is a close fit in the groove, while the lower, narrowed part of the tongue is held between the two adjusting screws *E*. Any taper in the work produced can be eliminated by adjusting or swinging part *B* on bolt *F*. Once this adjustment is made, the large retaining bolt *F* and the two adjusting screws give ample security against movement.

The circular cutter *H* is usable throughout four-fifths of its circumference. This gives a usable length of, say, 3 inches as compared with 1/2 inch for a flat tool for work of corresponding diameter. A common cause of failure in shaving tool cutters is the tendency of operators to have the cutting edge pass somewhat beyond the center of the work, to insure against any inaccuracy due to variation in the travel of the forming slide. This causes the tool to wear and to "build up" metal for a certain distance back of its cutting edge. The constantly increasing clearance of the circular tool removes this cause of short tool life, especially in cases where the work has square shoulders.

Section *X–X* shows the arrangement for adjusting and locking the cutter. The serrated button *D* is the same as the ones used for circular chasers in the die-heads applied to screw machine work. The cutter is broached at one end to receive the large diameter of the button. The cutter bracket is broached to receive the serrations on the smaller diameter of the button. The recess in the cutter is made deep enough so that the button enters flush with the end. The cutter is slid between the prongs of the holder, and the button, forced outward by the shoulder of the screw *C*, enters the serrations in the bracket. When the locking screw is tightened, the whole assembly is very rigid.

The method of adjusting the cutter shown in section *X–X* will be clear to anyone familiar with circular chasers. It is made easy by the fact that the serrations on the small end of the adjusting button are very slightly coarser than the serrations on the large end, thus making use of the vernier principle. To adjust the cutting edge forward to compensate for sharpening, the button is moved clockwise in the cutter one or more serrations and counter-clockwise in the bracket the same number of serrations, looking at the tool from the button side.

The difference in the pitch or spacing of the serrations on the large and small portions of the button *D* is so calculated as to give the fine forward adjustment of the cutter required. The greater the number of serrations the button is moved, the greater the adjustment will be. In actual practice, the button is moved one or two serrations in the cutter and the cutter is then put into a special holder and ground to a certain micrometer reading. The tool can then be locked into the holder and the machine started with the assurance that the cutting edge is on center. No adjustment subsequent to sharpening is necessary, either of the cutter or the holder.

With the usual type tool, the operator is often forced to use shims, pieces of tin, or paper under the tool to level it up, since there is no other means of adjustment. He also packs paper behind the tool to keep it from chattering. When the tool shank is sprung or the bolting surface worn, he shims up under the holder. The writer has known an operator to work two hours to get a tool to cut properly after it has been removed for grinding. The new type tool illustrated has eliminated much of the difficulty experienced with close-tolerance work.

Two-Station Transfer Die for Forming Strap

By F. SCRIBER

A transfer mechanism incorporated in the die shown in Fig. 1 makes possible the forming of strap *A* from a flat strip of stock *B* in two strokes of the press. The two ends of the flat strip are bent down over the front blocks *E* and *F*, as shown at *K*, at the first stroke of the punches *C* and *D*. The flat strip is located endwise against a pin *G*, being fed from the right-hand end of the die through a groove in guide plates *H* and *J* which hold the strip down when the forming punches ascend, upon the completion of the bending operation.

After performing the first forming or bending operation, the two bars *L* and *M*, attached to cross-member *N* at the front of the die, as shown in the upper view, push the work to the rear of the die, locating it under the forming punch *Q*. A side view of the die is shown in Fig. 2, the parts in both illustrations being indicated by the same reference letters. These views show how the parts *L* and *M* come in contact with the work at *P*. On the second stroke, the punch *Q* comes in contact with the work at the center, forcing it into the space between the ends *R* of blocks *E* and *F*. To insure stripping the formed piece *A* from the punch *Q* on the up stroke, a stripping block is provided at *S*, under which the work is located.

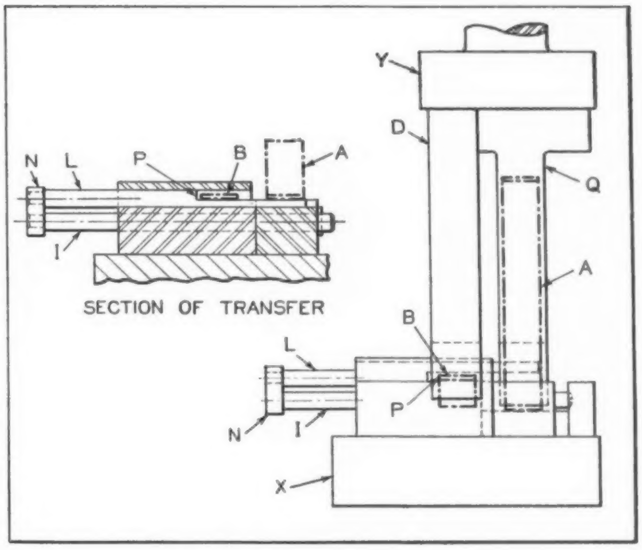


Fig. 2. Section of Transfer and End View of Die Shown in Fig. 1

The spring pad *T* carries the work out of the forming die, holding it in contact with the forming punch. All of the die members are attached to the bed *X*. The punch *Q* is attached to the holder *Y*, while punches *C* and *D* are attached to a spacing block *Z* which, in turn, is secured to the holder *Y*.

The transfer mechanism is well supported in the die-blocks, being provided with guide rods *I* and springs *O*. The operator merely pushes the bar *N* inward, thereby compressing the springs and pushing the work across the top of the die from the first to the second forming position. The transfer mechanism is then allowed to spring back to its original position. Another flat strip is then slid into place ready for forming. The bed of the press is inclined, so that the finished parts fall out at the back of the die.

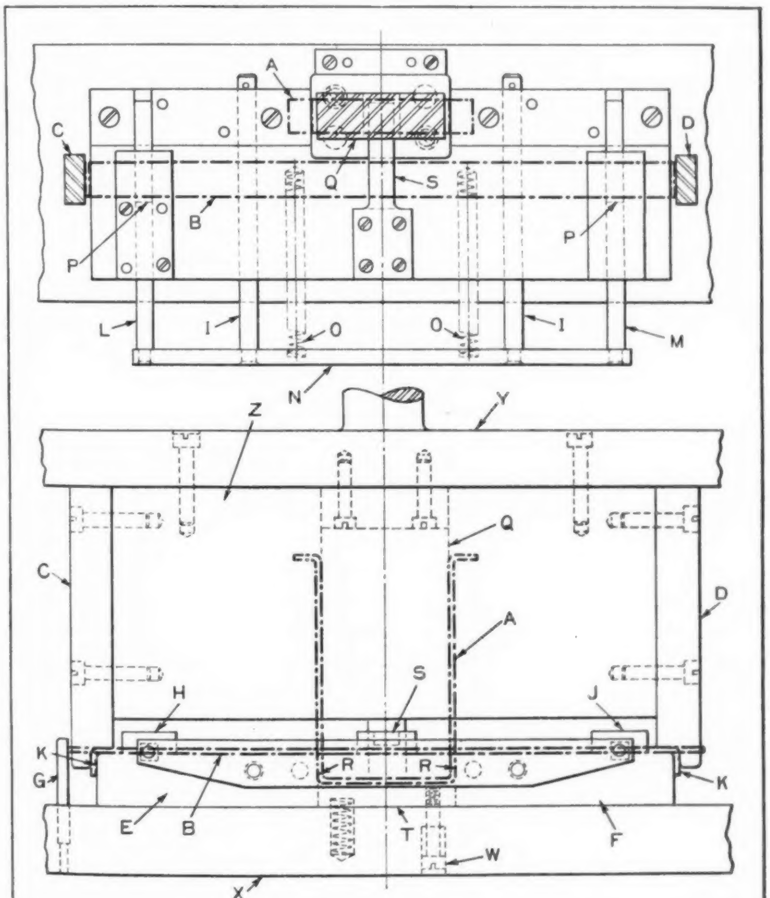
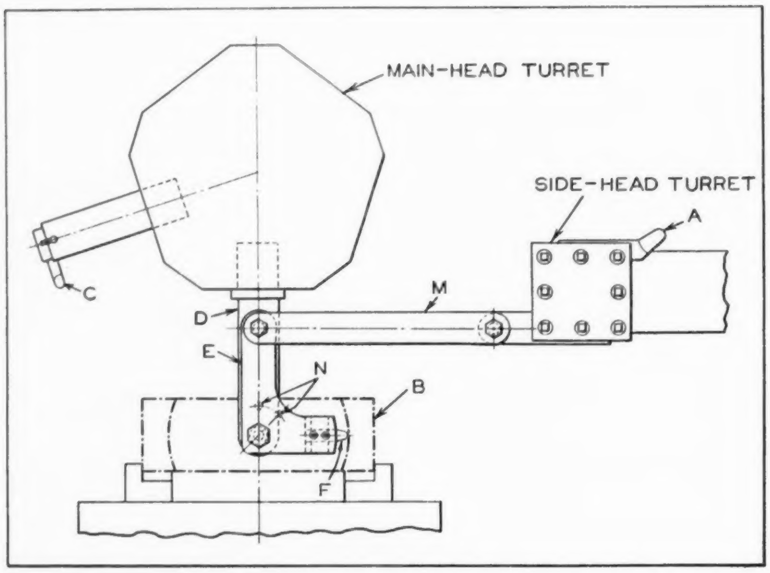


Fig. 1. Die Equipped with Transfer Device for Forming Strap A in Two Strokes of Press

Spherical Boring Tool for Vertical Boring Mill

By CHARLES C. TOMNEY, Chief Tool Designer
Carrier Corporation, Newark, N. J.

The spherical boring tool shown at *F* in the accompanying illustration (see next page) is used in a vertical boring mill for machining the work *B*. The tool *A* in the side-head turret is employed for facing the top surface of the work, while



Spherical Boring Attachment for Boring Mill

tool *C* in the main-head turret is used for rough boring.

The spherical boring tool consists of a shank *D*, on which is pivoted a bellcrank lever *E*. The boring tool *F* is held in lever *E* by means of set-screws, the cutting edge being located on the center line. After the work is faced and rough-bored, the spherical boring tool is brought into position by setting the main-head turret against its stop, in order to locate it centrally. It is then an easy matter to set the fulcrum of lever *E* central with the work by using the gage or scale, measuring from the turret face.

To operate the tool, the link *M* is connected to the side-head turret as shown, and the cross-feed is engaged. This automatically swings the tool *F* in a circle. Holes *N* are drilled for a pin that can be inserted to hold the lever out of the way when the other operations are being performed. This attachment can also be applied to a machine without a side-head, provided it has two heads on the cross-rail. In such cases, the link *M* is simply connected to the second head and the cross-feed is then engaged.

Pneumatically Operated Clamps for Rotary Milling Fixture

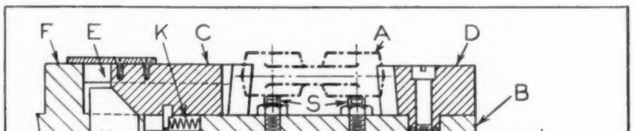
By JOHN A. HONEGGER, Bloomfield, N. J.

To facilitate the rapid production of connecting links of the type shown at *A* in the accompanying illustration, a rotary milling fixture was constructed for use on a vertical milling machine in which the clamping of the parts was accomplished automatically by means of compressed air. The illustration shows a section through one of the clamps of the fixture.

The fixture consists of the circular rotating member *B*, in which there are twenty-four V-block slide assemblies *C* and *D*. The ring *E* acts as a housing for the movable slides *C*, and is made a snug fit over the pilot ring *F*. Holes bored as shown at *G* are a snug sliding fit for the plungers *H*. These plungers act as wedges in forcing the slides *C* against the work. Leather packing *J* is used to prevent leakage of air around the plungers.

Springs *K* return the plungers *H* and the slides *C* to their original positions when the compressed air is released. The rest of the construction, including the worm-wheel and worm driving device, is self-explanatory. The packing at *L* and *M* is provided to prevent any undue leakage of air. It consists of oil-soaked leather strips, cemented into continuous rings and fitted into annular grooves cut in ring *Q* and in the base.

Each clamping assembly has a hole *N* to admit compressed air from the general air-distributing groove *P*. This groove extends around the inner surface of ring *Q* through an arc of 90 degrees, which gives ample time for clamping the work before it reaches the cutter and at a safe distance from the cutter. For a distance equivalent to an arc of 30 degrees, there is a seal between the compressed air chamber and the atmosphere, which is maintained by eliminating the groove from this sector. For the next 210 degrees, another groove is cut which connects with the atmosphere. Then the next 30 degrees is employed as a seal before connection is made again with the compressed air chamber groove. This gives ample time for the operator to unload and load the fixture, the loading being done by placing the work upon the two locating stops *S* in the position indicated by the dot-and-dash lines at *A*.



Section through One of Twenty-four Pneumatically Operated Clamps of a Rotary Milling Fixture

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Tool-Room Kinks for Boring Accurately Spaced Holes

In the accompanying illustrations are shown simple devices that can often be employed to advantage in boring accurately located holes. At *A*, Fig. 2, is shown a modified form of toolmaker's button that possesses some advantages over the conventional type when used for certain kinds of work. The thread for fastening the button to the work extends about one-quarter the length of the button. The remaining length is drilled out to provide clearance for the fastening screw. To fasten one of these buttons to the work, it is only necessary to drill a hole in the work a little larger than the body size of the fastening screw. Thus it is unnecessary to tap the hole in the work.

In Fig. 1 is shown an arrangement for locating and holding the work on a lathe faceplate in preparation for boring. After the buttons have been properly set, the work is attached to a pair of special parallels like the one shown at *B* in Figs. 1 and 2. The opening *C* in the center of the parallel is provided for the ends of the faceplate clamps *D*. In the headstock spindle of the lathe is a master plug *E*, which has an accurately bored hole that is a close slip fit on the button *A*. Assuming that the hole in plug *E* is true axially, it is a simple matter to locate one of the buttons *A* in the hole and then fasten the work in place with clamps *D*.

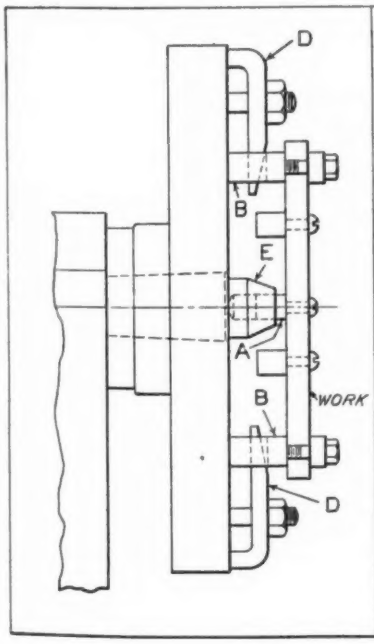


Fig. 1. Work Located by Button A for Boring One of Three Accurately Spaced Holes

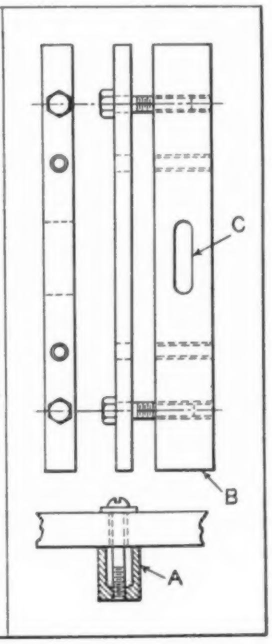


Fig. 2. Views of Button A and Parallel B, Fig. 1

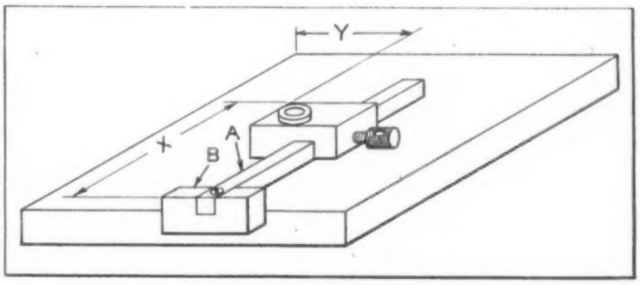


Fig. 3. Drill Bushing Block for Locating Holes Accurately

The depth of the hole in the master plug should be a little greater than the length of the button, so that the button can be pushed into the plug after the work is clamped in place. This is necessar in order to avoid interference with the boring tool. After each hole is bored, the button can be removed from the plug with a wire hook.

In Fig. 3 is shown another handy device for use in boring accurately spaced holes. It consists of an adjustable drill-bushing block with a slot which fits the beam *A*. The beam is fastened to stop *B*, thus forming a miniature T-square.

Care should be taken to see that the bushing and block are made accurately to dimensions that will facilitate taking the measurements required in locating the drill-bushing block. A knurled-head screw is provided in the drill-bushing block to permit locking it in position after the correct setting is obtained. Dimension *X* may be measured from either the outer or inner surface of the drill block and stop, while measurement *Y* can be conveniently made with a micrometer depth gage. When the device is properly located on the work, it may be clamped in place. All parts of the device should be hardened and ground.

Meriden, Conn. PETER L. BUDWITZ

* * *

The Copper & Brass Research Association is authority for the statement that in 1659 a copper coin was issued in Sweden worth slightly more than $5, which weighed 31 pounds and measured, roughly, 2 feet in diameter.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

A. C.—In deep drawing operations, the writer has experienced difficulty due to the metal from the drawn work rubbing off and adhering tenaciously to the surfaces of the die. This "built-up" metal results in a roughness that produces grooves in the finished part. The built-up metal can be scraped off the die surfaces readily, but it is a source of considerable annoyance in that it causes defective work. Can any of the readers of MACHINERY tell how this difficulty can be avoided?

Scale on Casehardened Parts

S. F.—We are having trouble with scale on casehardened parts that must be polished after hardening. This difficulty is met with periodically. Sometimes there are weeks at a time when there is no scale, and then we have trouble with it for a few days or a week, after which it may disappear again.

We pack these parts in a mixture of ground bone and charcoal, well shaken, to exclude the air as far as possible. The heating is done in an electric furnace and the parts are dumped directly from the pot, under water. What is likely to be the cause of our difficulty?

This question is submitted to MACHINERY'S readers.

Nickel-Steel Gears

S. G.—One of our customers has called upon us for gears approximately 1 3/4 to 3 1/4 inches in diameter, and specified the following composition: Total carbon, from 2.90 to 3.10 per cent; silicon, 1.10 to 1.30 per cent; manganese, 0.75 to 0.95 per cent; and nickel, 1.75 per cent. These gears are to mesh with others of the same material and must have good wearing qualities. We would appreciate comments on the above analysis and also on the advisability of putting steel in this mixture.

Answered by the Editor of "Nickel Cast Iron News," Published by the International Nickel Co., Inc.

The chemical requirements called for by your customer have proved to be excellent for gears, particularly of fairly heavy sections, and the only possible change we would make would be to allow a somewhat higher silicon content for the gears under consideration; we would suggest a range in this case of from 1.30 to 1.50 per cent. It has been our experience that it is advisable to keep the silicon content as low as possible in gears, as it reduces the tendency toward internal shrinkage in the casting; this is particularly desirable in the case of spoked gears and gears with a heavy rim.

We feel that, while the silicon content as given by your customer would result in an excellent gear, it would probably be found to have a greater hardness than the composition suggested above, and would therefore be somewhat difficult to machine. By increasing the silicon content slightly, we feel quite sure that you will meet the hardness requirements, and at the same time, improve the machineability of the casting.

In order to obtain a tensile strength of 40,000 pounds per square inch (which is largely dependent upon the carbon content of 2.90 to 3.10 per cent), it will be necessary to use enough steel in the mixture to develop this low total carbon content. This is common practice today.

Machines Using Elliptical Gears

A. H. S.—Are there any machines being built at the present time that employ in their design gears of elliptical shape?

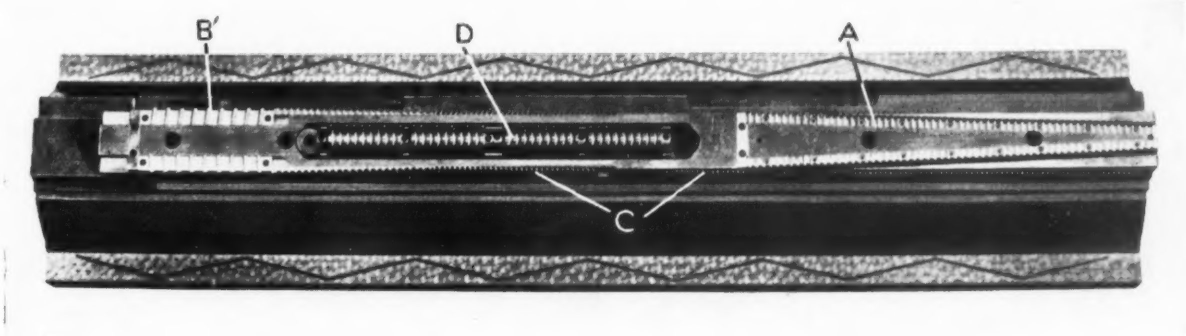
A.—This question was submitted to the readers in October MACHINERY. One reply received mentions that the Maier Machine Works, St. Louis, Mo., manufacturers of corrugated paper machines, use elliptical gears on the Maier spiral cut-off machine. The gears for one cutter are 8 1/4 inches largest diameter by 3 1/4-inch face, while on another they are 10 1/4 inches largest diameter by 3 1/4-inch face. The throw of each one is 3/4 inch off center.

The Bilgram Gear & Machine Works, Philadelphia, Pa., write that they cut a number of elliptical gears regularly for their customers. Of these gears, some are used in machines for making paper bags and some in machines for making cellophane containers. In addition, elliptical gears have been furnished for a variety of machines. In all cases, of course, they are used for transmitting power from one shaft running at a uniform speed to another shaft that is to run at a variable speed.

Sectional Broach Employed in Machining Cylinder Blocks

The application of broaching to the finishing of automobile cylinder blocks presented unusual problems, not only in designing the machines themselves, but also in designing the broaches. Difficulty was experienced, for example, in obtaining broach roughing sections that would stand up satisfactorily when breaking through the tough outer scale of the cylinder castings.

The illustration shows a sectional or built-up broach supplied on an Oilgear hydraulic horizontal machine that is being used for rough- and finish-broaching the main lock seats and crankshaft bearings on the bottom of six- and eight-cylinder engine blocks. One of the features of this broach is that the roughing section *A* is of a tapered design. Thus, as the broach proceeds across a casting, only a comparatively narrow width of tough outer scale is removed at any point along the broach. The broach cuts to an increasing width until the rear end of the roughing section is reached.



Sectional Broach Provided for a Hydraulic Horizontal Machine that Finishes the Main Lock Seats and Crankshaft Bearings on the Bottom of Automobile Cylinder Blocks

This roughing section was at first designed with each tooth cutting to the full width of the work surface, but the extremely short broach life necessitated a different construction. The flat surfaces that are rough-broached by section *A* are finish-broached by section *B* as the ram of the machine nears the end of its working stroke. Teeth on each side of the broach, as indicated at *C*, finish vertical surfaces at right angles to those machined by broaches *A* and *B*.

Broach *D* finishes the crankshaft bearings. Although these bearings are semicircular, the broach is made completely round. Thus when one half of this broach section has been dulled, it can be turned through 180 degrees to double the life between regrinds. This broach is made up of two sections. The broach slide has an over-all length of 84 inches. It is designed for use on a machine that has a stroke of 130 inches, a broaching speed of 24 feet a minute and a return speed of 60 feet a minute. The machine is 28 inches wide, 67 inches high, and 26 feet long. It weighs 32,000 pounds.

Soviet Russia Plans to Double Automobile Production

The automobile and truck production capacity of Soviet Russia is to be doubled during the next two years, according to Stanley Shaw of the Michigan Tool Co., Detroit, Mich., who has just returned from a six months' stay in Europe, the last three months of which were spent in a survey of the industries in Russia. This increase will provide for a daily output of five hundred passenger cars and one thousand 1 1/2-ton trucks at the Gorky automobile plant, which at present employs some 23,000 people. According to Mr. Shaw, this plant is very efficient in its operation and compares favorably with many plants in the United States.

Mr. Shaw attributes the efficiency of the plant to several factors: First, the extensive educational program provided for the training of the men and women in the plant to make them masters of their respective trades. Second, the complete abandonment in Soviet Russia of the hourly wage in favor of a bonus plan of payment, whereby the work is paid for according to results—or amount turned out. This is an interesting development of Sovietism in view of the fact that such systems of payment are generally disapproved by the labor unions in the United States, who favor the hourly rate. Third, the use of the very latest and best type of machine tool equipment. The latest improvements in machine tools are being installed constantly.

* * *

Hard-Facing Keys for Worn Keyways

Considerable machining time and labor can be saved in replacing pulley and gear keys by a simple welding trick. When the keyway becomes worn, so that the pulley or gear is loose on its shaft, an over-size key, tipped with a thin welded-on layer of a hard-facing alloy, can be driven into place. If the hard-faced end has previously been sharpened, it cuts its way in to a snug fit and lasts considerably longer than a new key.

Forming Mill for U-Shaped Sections

By JOSEPH WAITKUS

CONSIDERABLE experimental work is often necessary in developing tools or equipment for the production of special parts. Frequently several designs are worked out which will meet the requirements. This was the case in developing a forming mill for the production of U-shaped strips. Two types of forming mills were developed, as shown in Figs. 1 and 2, the shapes of the strips produced being as indicated at *U*.

The dimensions of the U-shaped strips vary somewhat, the range of sizes being about as indicated at *U*, Fig. 2. The actual widths were required to be held to fairly close tolerances. However, the depth was not so important, and was set at a constant dimension, so that only a slight variation in the width of the flat stock was required for each width of U-shaped strip. The length of the formed strip was immaterial, since it was cut into short pieces of the desired lengths. The maximum thickness was equivalent to No. 16 gage.

As an aid in starting the strip through the breakdown rolls, the corners of the strip are chamfered,

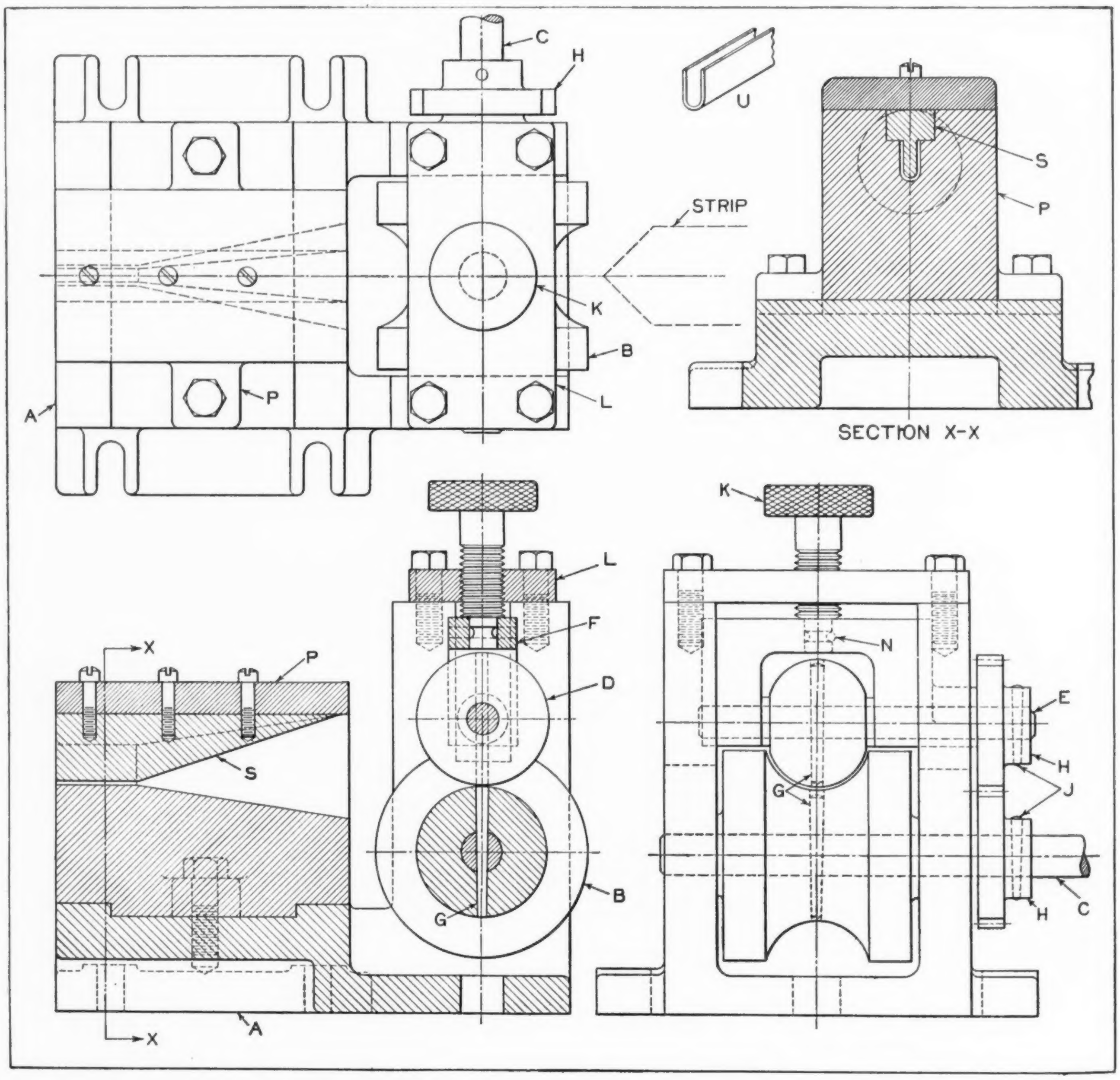


Fig. 1. Forming Mill for Producing U-shaped Sections from Flat Strip Stock

as shown by the dash lines in the entering position in front of roll *B*, Fig. 1. When once started a light pressure on the strip by the operator is all that is necessary to guide the material.

Forming-Block Type of Forming Mill

The forming mill shown in Fig. 1 was designed first. This stationary type of forming mill consists of a pair of break-down rolls *B* and *D* fastened to their respective shafts *C* and *E* by taper pins *G*. Power is applied through a speed reducer to shaft *C* and transmitted to shaft *E* through a set of spur gears *H* which are also fastened to their respective shafts by taper pins *J*.

The roll *B* is supported on fixed bearings in the cast base, while the roll *D* is held in an adjustable yoke *F* which is mounted in a slide machined in the base. The upper roll *D* can be adjusted with relation to the lower roll *B* to accommodate material of different thicknesses, by means of the screw *K*, retained in yoke *F* by pin *N*.

The forming block *P* is mounted in a crosswise slot in the base *A* so that it can be adjusted to line up with the break-down rolls. This key-and-slot mounting also provides ample resistance to the horizontal pressure exerted against the forming block. The internal forming piece *S* is fastened to the forming block *P*. The combination of these two parts provides the U-shaped opening in which the final forming operation on the metal strip takes place and which determines its dimensions.

A different combination of forming blocks is necessary for each size of U-shaped strip. In order to form the strip to the desired shape with the least resistance, the entrance to the forming block is shaped to a full circle. From this opening, the forming block is gradually tapered to U-shape. The distance from the forming block to the break-down rolls is kept as short as possible.

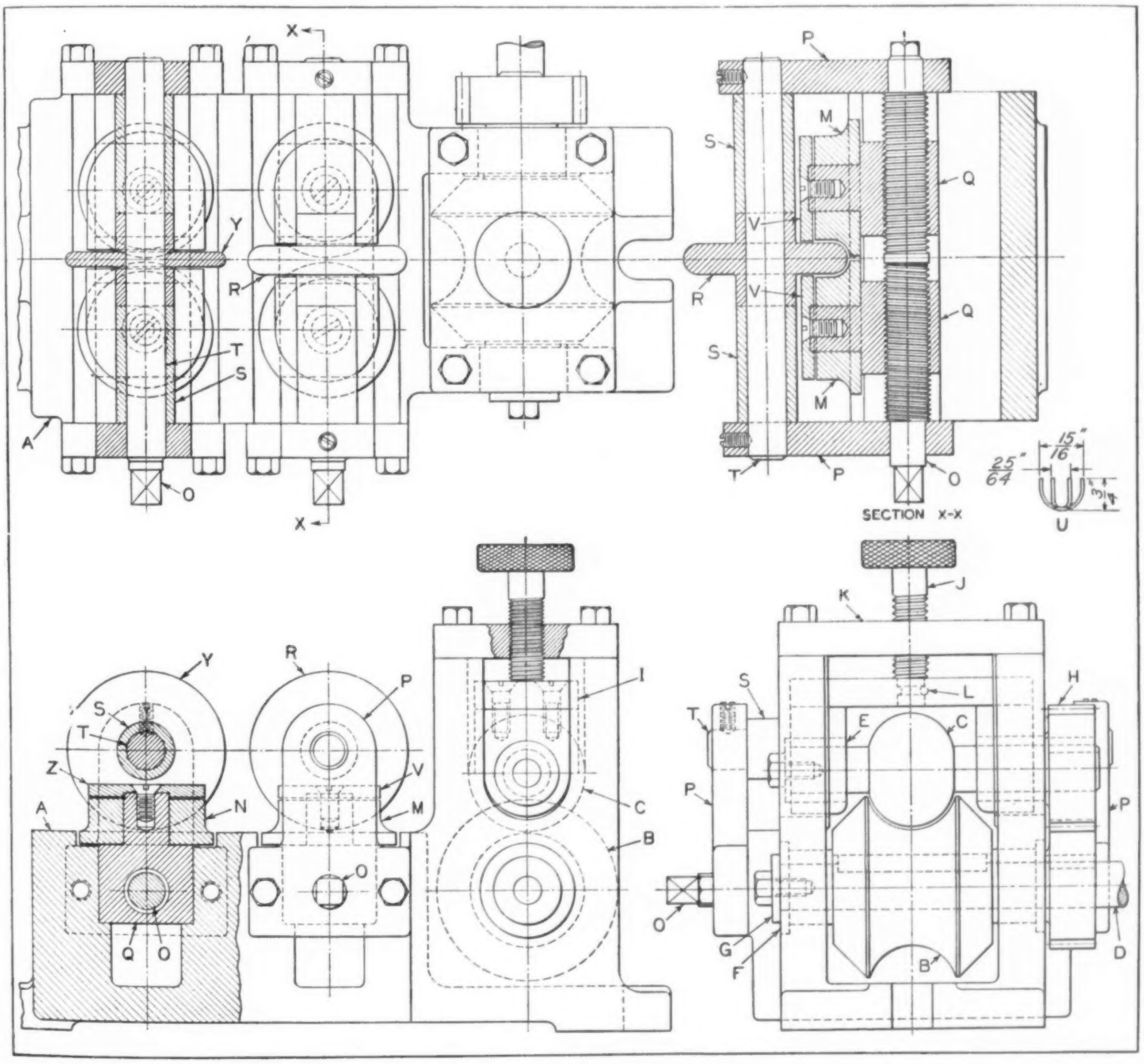


Fig. 2. Adjustable-roll Type Forming Mill for Rolling Sections such as Shown at U

This forming mill is relatively simple in design and will produce excellent results. However, it has limitations in that no means are provided for adjusting the width of the formed strip. That is, if the width of the work is required to be held to very close limits of accuracy, the forming block must be accurately machined. Some experimenting may be necessary to determine the best contour for the forming block in order to permit the forming operation to be performed as easily as possible. If the device is to be used for a considerable length of time, the materials used in its construction must be carefully selected. In spite of its limitations, this type of forming mill can be constructed economically and is most desirable when only a moderate quantity of strip material is to be formed. It is particularly well suited for the more ductile metals, such as brass and aluminum.

Adjustable-Roll Type Forming Mill

The arrangement of the forming mill shown in Fig. 2 provides greater flexibility and efficiency than that shown in Fig. 1. The break-down rolls are arranged somewhat the same as those shown in Fig. 1, but they are of more rugged construction. The roll *B* is keyed to the shaft *D* and is supported in the bearings *F* provided in the supporting casting *A*. A washer *G*, held in position by a cap-screw, serves to retain the shaft in position between the bearings and facilitates the removal of the roll when necessary.

The shaft or trunnions machined on roll *C* are supported in bronze bushings *E* in the yoke *I*. The yoke is retained between machined surfaces on the supporting casting *A* and is assembled in a manner that permits it to be completely dismantled for the removal of the roll *C*. Gears *H* are keyed to the shafts and serve to transmit motion from shaft *D*, which, in turn, is connected through a speed reducer to a motor drive. A yoke adjusting arrangement is provided in the form of a screw *J*, secured to the yoke by a pin *L*. The tie-plate *K* supports the yoke through the screw *J*.

The forming rolls *R* and *Y* are next in line in back of roll *C*. These serve as finishing rolls, each being provided with two auxiliary rolls *M* and *N*, respectively. The auxiliary rolls form the exterior surface of the strip to the required shape, while the forming rolls *R* and *Y* serve as forms for the interior surface. The auxiliary rolls are mounted on spindles provided in the adjusting blocks *Q*. Two adjusting blocks are arranged on each screw spindle *O* supported in the bearing blocks *P*. The right- and left-hand threads on the spindles *O* permit the forming rolls to be adjusted toward or away from each other as required. The covers *V* and *Z* fastened to the spindles of the rolls *M* and *N*, respectively, retain the rolls in place on their spindles. The forming rolls are supported on the shafts *T* between the sleeves *S* and in bearings provided in the bearing blocks *P*. In general, the complete assembly of the forming rolls *R* and *Y* is alike, with the exception that they diminish in size toward the finishing end, the last roll being the final finishing one that determines the dimension of the U-shaped strip.

As the metal passes from the break-down rolls and enters the forming rolls, adjustments can be made by means of the screws *O* which will facilitate the progress of the forming operation. By increasing the number of forming rolls, less ductile metals can be formed easily. The covers *V* and *Z* act as gages and limit the height of the U-strip, keeping it uniform and level. This is very important on the final finishing roll. It is evident that this forming mill is easier to operate and requires less power than the one shown in Fig. 1.

* * *

Agricultural Engineers Discuss Farm Machinery

The importance of farm machinery in the lowering of farm production costs and in improving farm products; in conserving the soil and water resources; and in improving farm homes and living and working conditions on the farm is one of the subjects that is being dealt with by the American Society of Agricultural Engineers, which is holding its winter meeting at the Hotel Stevens, Chicago, Ill., from November 30 to December 4—just as MACHINERY goes into the mails. Recent progress in farm machinery research; the testing of farm machinery; the small type, all-purpose tractor; and farm machinery trends in Europe are among the subjects being discussed by the Power and Machinery Division of the Society. The headquarters of the American Society of Agricultural Engineers are at St. Joseph, Mich.

* * *

Grinding Machine of Huge Proportions Correction

In the description of the Churchill grinding machine on page 109, October, 1936, MACHINERY, it was stated that the machine was capable of handling work up to 7 feet in diameter and 30 feet long. We have been informed that the figures received by us were incorrect as regards the length of work. The capacity of the machine is for work up to 7 feet in diameter by 30 inches long.

* * *

It is mentioned by the Copper and Brass Research Association that some of the poorer classes in Turkey invest their savings in copper utensils. Their standing in the community is largely measured by the number of utensils that they possess. During hard times, when they need money, they dispose of some of these articles, for which there is always a ready market.

The Influence of Welding on Machine Design and Shop Practice

How Design for Welding Defers Obsolescence and Reduces Costs in Both the Manufacture and Use of Machine Equipment and Metal Products—Paper Read by Erik Oberg, Editor of MACHINERY, before the Annual Meeting of the International Acetylene Association in St. Louis—First of Two Installments

WHEN the oxy-acetylene blowpipe was first introduced into the mechanical industries, none of the men engaged in its early development could have had any idea of the revolution in machine shop methods that this new device would bring about. At first, oxy-acetylene welding was thought of mainly as an aid in making repairs. Not even in the boldest dreams of the inventor is it likely that he foresaw the use of the blowpipe in the building of huge machinery and in the making of products in almost every branch of industry.

In considering the application of welding in machine design, we are dealing with two distinct processes—first, the flame-cutting of metal, in order to obtain the required plates and other parts in the shapes needed for welding, and second, the welding process itself. Whether the welding be gas welding or electric welding, the cutting of the material by the oxy-acetylene flame preparatory to welding has become a universally accepted procedure.

The Flexibility of Flame-Cutting and Welding is One of the Chief Advantages of the Process

The flexibility of the oxy-acetylene flame-cutting process in conjunction with welding is probably one of its most outstanding advantages. By means of flame-cutting and welding, the manufacturer is enabled to make quick changes in the design of a product whenever desirable. New designs can be brought out without long delays and can quickly be placed on the market. There need be no fear of increasing manufacturing costs because of a change in the product, since the cutting and welding equipment is easily adapted to the new requirements. There will be no need to scrap a highly specialized machine developed for making the old design, as is often the case when the product is produced by machining processes only.

This adaptability of the flame-cutting and welding process to new designs without any appreciable additional cost has probably done more to accelerate the use of this process than any other factor. In the past, the designer has always had to take into consideration the possibility of a complete change-over in machine equipment for producing a redesigned product. With the new methods, hardly any limitations of this kind are placed upon him. Changes in design can be made either gradually or rapidly, as the conditions demand. It is possible, without great inconvenience, to manufacture an older and a newer design side by side, because sheet steel, plate, and forgings can be cut to practically any desired size or shape with the same cutting machine and welded with the same standard equipment.

Oxy-Acetylene Flame-Cutting is One of the Great Developments in Mechanical History

There is no exaggeration in the statement that the use of steel plate, cut to shape by the oxy-acetylene shape-cutting machine, for the manufacture of welded machine beds, frames, machine parts, and other metal products, is one of the most revolutionary recent developments in the mechanical industry. The economic effects of this process are far-reaching, and have already manifested themselves in a number of industries. Many more will benefit from the savings made possible through the use of these processes in the future.

The immediate effect of flame shape-cutting has been to speed up production to a remarkable extent without increasing existing facilities. The fact that steel plates can be cut to the required shape as orders are received has simplified many phases of plant management, such as storage, inventory, and purchasing. There is no longer any need to order castings and forgings in large quantities and store them away for future requirements.

While some machine manufacturers have been rather slow to appreciate the value of the new tools placed at their disposal in the form of flame-cutting machines and welding equipment, many others have rapidly become conscious of the advantages offered them by the new processes. Many heavy pieces of equipment have recently been completely redesigned to take advantage of welded construction. The new processes have become standard

production methods, and the equipment used in these processes has been highly perfected. Within the last few years, standardization and code formulating bodies have accepted welded structures for equipment requiring a high degree of safety, such as vessels subjected to internal pressure.

Great Savings in Equipment Cost Have Been Effected by Flame-Cutting Machines

The savings in the cost of equipment brought about through the introduction of flame-cutting machines are noteworthy. In the past, for all cutting and rough-machining of steel, a large investment in heavy machinery was necessary, since such processes as shearing, sawing, milling, etc., had to be used. Much of the work done by these heavy machines can now be performed by a single oxy-acetylene cutting outfit. Again, the flexibility of the equipment becomes apparent. One minute it may be used for cutting sheet steel or light plate, and the next it may be switched to a job of cutting steel billets 8, 10, or even 12 inches in thickness. As a result of this ease of cutting metal, combined with the welding process, machine bases, frames, housings, and other parts of most complicated design are now fabricated with an ease and simplicity that the mechanic of twenty-five years ago could not have imagined.

Perhaps the most outstanding savings are to be found in the case of the very heavy machine frames used for electric generators and hydraulic turbines. Here only one or at most two or three frames of the same size and design are required. When made from castings, these become extremely expensive and require large and costly pattern shop and foundry equipment. The cutting up of steel plate, forming it to the proper shape, and welding it, on the other hand, is a comparatively simple process and requires no unusual or highly expensive equipment. The whole frame is completed in less time than it would take to make the pattern for the casting.

In the automobile industry, we also have some obvious examples of the value of the cutting and welding processes, because here models are changed frequently; but the oxy-acetylene manufacturing equipment does not become obsolete. If expensive dies, for example, were used to cut out sheet-metal parts, they would have to be replaced every time a slight change in the design of the car was made; but the flame-cutting and welding processes can be adapted to these changes at practically no cost. The same applies in the farm machinery field, where flame-cutting and welding are processes largely used in the manufacture of combines, threshers, weeders, and other farm machinery.

Probably the greatest advantage of the welding process to the designer of machinery is the latitude that it allows him in his work. He can use his imagination freely in developing a design and need not follow hidebound traditions. If he makes a mistake in a welded structure, it can be more easily corrected, and he is therefore in a position to approach his problems in a bolder frame of mind and to try out designs radically different from those used in the past. He does not have this freedom to anywhere nearly the same degree when patterns and castings are involved. Then changes after the machine is completed are more costly, if not entirely impossible; and obviously, the designer is more likely to follow traditional and conservative methods.

In designing machines to be produced by welding, the entire aspect is changed. If the first machine or machines in a lot of a standard type should seem unsatisfactory, the design can be improved with little or no cost beyond that incurred in the drafting-room. There are no costly patterns to scrap, and slight changes can be incorporated almost from day to day. In that way, the welding process paves the way for the development of the best possible designs in standard machine construction. Then there is a further advantage of particular importance to the designer—many designs that would not be practicable if cast, can be welded; and ribs, walls, pads, and bosses can be located in the most convenient positions.

The ideal sections for resisting heavy tool loads are closed sections—box or tubular sections. Such sections are not easily produced in cast iron because of the complicated core work; but they can be rather easily made in welded steel. An authority on the design of machine frames for welding points out that through the use of closed, welded sections it is possible to effect a gain in stiffness, with the same amount of material, of from 200 to 300 per cent. If such a gain in stiffness is not required, then a reduction in weight is possible, combined with improved qualities in the bed structure.

The flexibility of welding makes it possible to obtain wearing surfaces of great hardness for the sliding surfaces of machine tools. Lathe beds, for example, are being built today, the main section of which is a closed box of low-carbon steel, with ways that are welded integral with the bed and are made from a steel that can be hardened. A process is being used which, after a welded bed has been completed, will harden each sliding surface to a depth of 3/16 inch and to a hardness of 530 Brinell. Such an experimental welded-steel lathe bed has been in service for about four years. It weighs 30 per cent less, and we are told that it has twice the stiffness of beds used for similar sizes of lathes.

Attractive Welded Designs are Now Being Made to Conform with Present-Day Styles

In the early days of welding, the objection most frequently raised by machine builders was that the welded design was not so attractive in appearance as a casting or a forging. The machine builder who held this opinion was justified, because at that time, most machine frames and beds, for example,

of welded design were rather crudely put together. In fact, one welding enthusiast advocated the use of structural shapes and pipe sections. The angles, I-beams, and pipes formed a framework that doubtless had the required strength and rigidity, but that was anything but handsome to look at.

Very rapidly, however, came the appreciation of the fact that by the proper use of plate and flame-cutting, one could shape a machine bed as gracefully by the welding process as formerly in the foundry mold or forging die. As a matter of fact, in many instances appearance has been improved by welded designs, because it is easier to so arrange the design that levers, links, pulleys, piping, etc., may be concealed and yet accessible. Frequently that is difficult to achieve with a cast design, because the designer does not have as much freedom in placing his material. He must constantly think of the foundryman's problem and be sure that his design can be cast.

It has sometimes been said that welded machine frames are too straight and stiff in appearance. This effect is now frequently avoided by welding the plates together at slight angles. The corners may be rounded, if desired, and curves are now as frequently seen in welded structures as in those made by earlier processes. Then there is another great advantage. If there are parts that may be difficult to weld, the welded design permits of smaller stampings, castings, drop-forgings, etc., being included in the design and appropriately welded to the main frame as required. Welding has actually brought about a new style in machine frames. There are more flat surfaces and, as a rule, the corners have smaller radii than in the case of castings. Still, if it is desired to have well rounded corners, it can easily be obtained in welded structures as well.

And as regards appearance, don't let us forget that, after all, the ideas as to what looks well are largely matters of habit and are subject to change. Just think of our automobiles of twenty years ago. We thought that some of them were very handsome cars; and yet, who would consider a 1916 car handsome today? Taste in appearance and form changes. The welded design, with its clean-cut lines will doubtless be considered the right and appropriate design for most machines as the years go on.

In January MACHINERY, important points that must be taken into account by the machine designer in designing for welding will be considered.

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Improvement in Employment Conditions in the Automobile Industry

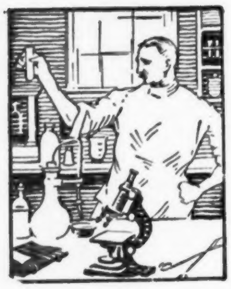
In a recent statement by William S. Knudsen, executive vice-president of the General Motors Corporation, it was pointed out that since 1934, the average yearly income of all workers in the automobile industry has been increased almost $500. Employment records further show that approximately 70 per cent of all the workers on the automobile factory payrolls during any time of the 1936 production year were steadily employed throughout the entire twelve months. The wages of those who were steadily employed for the entire year were $170 more than the average earnings of steadily employed workers in 1934.

Twenty-five million additional man-hours of employment were provided in the automotive industry last winter through the operation of a plan in which the automobile manufacturers undertook to keep employes on their payrolls by building up inventories of automotive parts and sub-assemblies for use later during the year.

Mr. Knudsen also pointed out that the industry has effected substantial improvements in its labor turnover. The monthly ratio of lay-offs was reduced from over 7 per cent to less than 5 per cent, and the ratio of the number of those who quit or were discharged was cut in half.

Twenty-three and One-half Tons of Spherical Roller Bearings of this Size were Supplied by the S K F Co. for the Zaporojstal Steel Mill in Soviet Russia. These Bearings Measure 46 1/2 Inches in Outside Diameter, 27 1/2 Inches in Bore Diameter and 15 1/8 Inches in Width

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

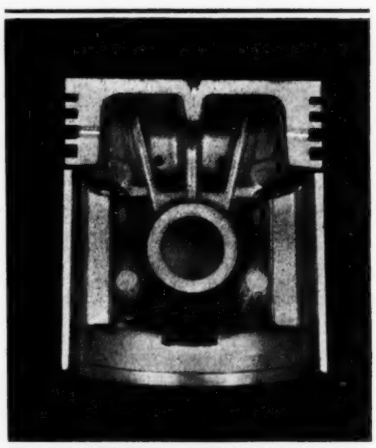
Colored Strip Steel that can be Bent and Drawn

Cold-rolled strip steel finished in any desired color or shade can now be supplied by the Acme Steel Co., 2840 Archer Ave., Chicago, Ill., in widths from 1/4 inch to 8 inches. This material can be bent, drawn, or formed without marring the color, and is therefore suitable for use where a formed part is colored after fabrication. "Colorstrip" is made in thicknesses from 0.008 to 0.042 inch, and can be supplied in any standard temper.

Aluminum Pistons with Steel Inserts that Control Expansion

Thermostatic control of expansion is a feature of a Nelson Bohnalite aluminum alloy piston recently announced by the Bohn Aluminum & Brass Co., Detroit, Mich. This piston is designed in a novel manner to compensate for the difference in heat expansion of the cast-iron cylinder and the high silicon-aluminum piston. Steel inserts or plates punched and formed from low-carbon steel are cast in these pistons, as shown in the accompanying illustration, in such a manner that the ends of the inserts are anchored to the piston skirt but are not fastened to the piston-pin bosses.

These steel strips are covered by aluminum sections for their entire length, thus forming a thermostatic element from which the trade name "Autothermic" is derived. Since the aluminum expands more than the steel when heated, this thermostatic element will assume a curved form that tends to increase the expansion of the skirt in the direction parallel to the piston-pin, and to reduce the expansion along diameters perpendicular to the piston-pin. This effect can be varied by changing the cross-sectional proportions of the steel or the aluminum thermostatic sections. These expansion characteristics cause a piston skirt of cylindrical form at the working temperature of the engine to assume an oval shape at room temperature. Therefore, the skirt is ground oval when manufactured.

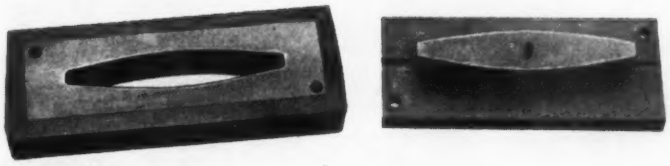


Nelson Bohnalite Piston with Steel Inserts that Provide a Thermostatic Control of the Expansion

Free-Machining Monel Metal for Automatic Operations

A grade of Monel metal that is sufficiently free-cutting to permit machining at high production speeds in automatic screw machines and similar equipment has recently been developed by the Huntington Works of the International Nickel Co., Inc. This R-Monel metal is especially suitable for screws, bolts, etc. Its easy machining properties have been obtained by the addition of a small quantity of sulphur.

R-Monel metal is slightly less resistant to corrosion than the ordinary forms of Monel metal, and is not quite so strong. The tensile strength of cold-drawn rods and bars of R-Monel metal up to 3 inches (Grades 1 and 2) ranges from 80,000 to 115,000 pounds per square inch, and the yield strength from 50,000 to 90,000 pounds per square inch, whereas the tensile strength of cold-drawn rods and bars of regular Monel metal up to 3 inches ranges from 85,000 to 125,000 pounds per square inch, and the yield strength from 60,000 to 95,000 pounds per square inch. Hot-rolled rods and bars of R-Monel metal up to 3 inches (Grades 1 and 2) have a tensile strength ranging from 75,000 to 85,000 pounds per square inch, and a yield strength



Blanking die that has cut 10,000 pieces of 1/8-inch alloy steel for bumper guards and does not require grinding. This die was made of Top Notch steel, a chromium-tungsten alloy with a vanadium addition, produced by the Jessop Steel Co., Washington, Pa. It is used by the Burton Auto Spring Co., Chicago, Ill.

from 35,000 to 60,000 pounds per square inch, whereas hot-rolled bars of regular Monel metal have a tensile strength between 80,000 and 95,000 pounds per square inch, and a yield strength between 40,000 and 65,000 pounds per square inch.

R-Monel metal is not recommended for parts that must be subjected to more than a moderate amount of cold upsetting, and it is not intended for hot working. It is produced in different grades which have been developed for different sizes of work and for various machining speeds. For example, Grade 1 is for work of the larger sizes machined in lathes; Grade 2 for work produced in automatic machines; and Grade 3 for unusually intricate work that must be machined at high speeds.

A Copper Alloy for Welding Equipment

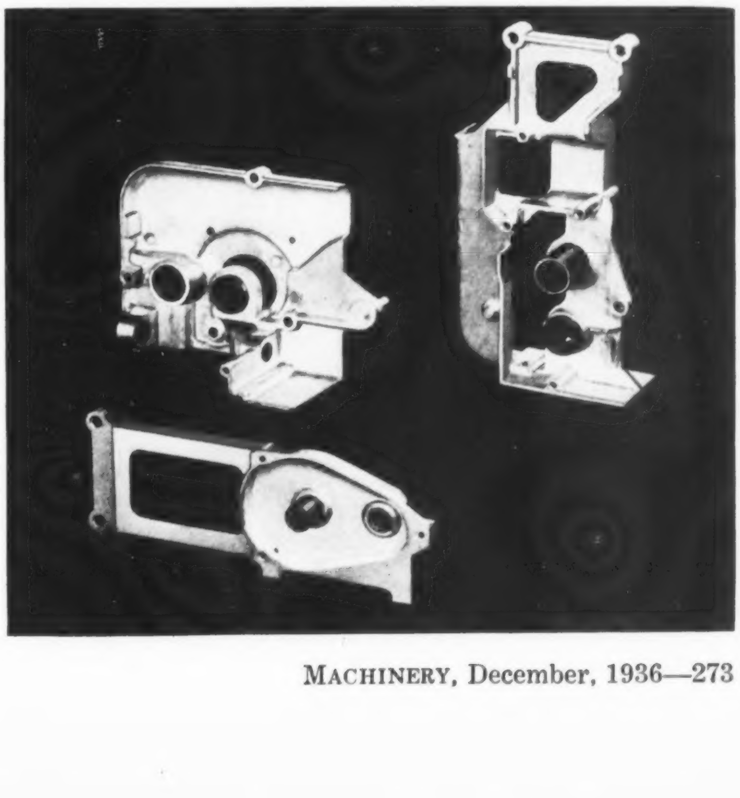
A copper alloy that is especially suitable for use on welding equipment has recently been placed on the market by the Hackett Brass Foundry, Detroit, Mich. Hackett K-Copper, as the alloy is called, combines the physical properties of steel and bronze with the high electrical and heat conductivity of copper. Compared with pure copper, the alloy is said to possess equal corrosion resistance and the same coefficient of expansion, coefficient of resistivity, and modulus of elasticity. The alloy has a hardness of 70 to 80 Rockwell B (125 to 150 Brinell), an ultimate tensile strength of 70,000 pounds per square inch, an elongation of approximately 20 per cent and a reduction in area of 50 per cent.

In the drawn rod form, this alloy possesses about 83 per cent of the electrical conductivity of pure drawn copper, and in the forged form, from 75 to 85 per cent that of forged copper. The alloy is available in bars, forgings, and castings, and is being used for welding tips and holders. Welding tips made from this alloy are said to mushroom less easily than those made of pure copper, require less frequent dressing, and give a greater number of welds during their life.

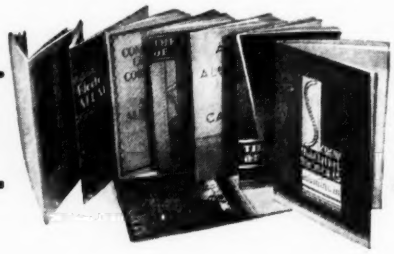
Alloys Rolled to Six Millionths of an Inch in Thickness

Strips of two alloys, Copnic and Chromel, were recently welded together and rolled to a thickness of only six millionths inch in the laboratories of the General Electric Co. Gold has been beaten to four millionths inch and aluminum to ten millionths inch, but this is believed to be the first time that two alloys, welded together, have been reduced to such a thin section by rolling.

One of the alloys consists of copper and nickel, and the other of chromium and nickel. After being welded, they were placed between pieces of steel for the rolling operation.



Metering device housing parts made from a zinc-base-alloy die-casting by the Superior Die Casting Co., Cleveland, Ohio. This housing has threaded inserts, bearings, and studs cast in place, and represents an intricate and accurate type of die-casting. The part could not be produced by any other process except at an excessive cost.

NEW TRADE  LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts, and Materials. Copies can be Obtained by Writing Directly to the Manufacturer.

Carboloy Wheel-Dressers

CARBOLOY CO., INC., 2987 E. Jefferson Ave., Detroit, Mich. Catalogue describing the diamond-impregnated Carboloy dresser for rough, semi-finish, and finish dressing of all types of grinding wheels. In addition to the specifications and prices, the catalogue contains several features of interest to production executives, namely, information on the construction and development of the dresser; a comparison of the diamond-impregnated Carboloy dresser with the ordinary single diamond dresser; and illustrations and descriptions showing how the Carboloy dresser eliminates remountings, gives complete diamond usage, produces wheel dressings at a minimum cost, and gives uniform results throughout its life.

Stainless Steel

REPUBLIC STEEL CORPORATION, Cleveland, Ohio, is distributing a new series of booklets on Enduro stainless steel. The series consists of five booklets, the first of which explains the reasons for the rise in popularity of stainless steel and illustrates many of the more important applications of Enduro. The second contains detailed data on Enduro 18-8 and its several variations. The third booklet is devoted to the straight-chromium types of Enduro designated AA, S, S-1, and FC. The fourth contains information on the heat-resisting types of Enduro, namely HCN, HC, and NC-3. The fifth treats of Enduro 4-6 per cent chromium steels, which are not stainless but are intermediate between ordinary carbon and stainless steels.

Electric Measuring Instruments

LEEDS & NORTHRUP CO., 4921 Stenton Ave., Philadelphia, Pa. Broadside 160, describing Leeds & Northrup power plant measuring instruments, telemeters, and automatic controls. Specific applications are mentioned—in electrical generation and transmission, in steam generation and distribution, in hydro-power generation and in Diesel power generation—in which these equipments are being used to safeguard operation and to effect operating economies. This catalogue should be of interest not only to power-plant executives, but also to engineers in industrial plants.

Indicating, Recording and Controlling Equipment

BROWN INSTRUMENT CO., Wayne and Roberts Aves., Philadelphia, Pa. Catalogue 6703, covering the complete line of Brown thermometers and pressure gages of the indicating, recording, and controlling types. The catalogue describes the different classes of thermometers and pressure gages and explains their outstanding constructional features in simple non-technical language. It lists the wide range of industries to which these instruments are applicable.

Norbide Abrasive

NORTON CO., Worcester, Mass. Price lists of Norbide abrasive and Norbide metallurgical compound. Circular containing installation instructions covering Norbide pressure blast nozzles and hose fittings. Circular describing the characteristics, method of manufacture, and uses of Norbide. Pamphlet entitled "Boron Carbide, a New Crystalline Abrasive and Wear-Resisting Product," giving chemical composition, properties, applications, etc. Bulletin descriptive of pressure blast nozzles equipped with liners of Norton boron carbide.

Speed Control Equipment

REEVES PULLEY CO., Columbus, Ind. Booklet entitled "Speed Control at Work," illustrating and describing the methods employed by twelve nationally known manufacturers in securing complete speed adjustability of production machines in their plants. In addition, three basic units in the complete line of Reeves speed control equipment are described, and a number of different designs and controls are shown.

Steel

UNION DRAWN STEEL CO., Massillon, Ohio. Booklet entitled "The Symbol of Quality in Cold-Finished Steel Bars," covering carbon and alloy steel cold-drawn steel bars, Union Free-cut and Super-cut screw stock, high-manganese screw steel, Enduro stainless steel, cold-finished shafting, and cold-drawn special sections. Also folder covering Union Bessemer screw steels entitled "What Hundreds of 'Automatic' Operators Have Learned About Tool Life."

Hard-Facing Materials

STOODY CO., Whittier, Calif. Booklet entitled "The Numbered Stoodites," describing three types of hard-facing materials developed especially for application to metal-cutting tools, one of which is suited for general shop use, another for drop-hammer dies and other tools subjected to a great amount of impact shock, and the third for tools that must maintain their original shapes and sizes for long periods of time without being ground.

Hydraulic Machinery, Testing Machines, Diesel Engines, Etc.

BALDWIN-SOUTHWARK CORPORATION, Philadelphia, Pa., is issuing a quarterly publication known as the *Baldwin-Southwark*, the first issue of which celebrates the one-hundredth anniversary of the Baldwin-Southwark Corporation (previously known as the Southwark Foundry & Machine Co.), which had its inception in the business established by the firm of Merrick & Towne in 1836.

Metal Finishing

GRASSELLI CHEMICAL CO., INC., 629 Euclid Ave., Cleveland, Ohio.

Catalogue on metal finishing equipment, including electroplating equipment and electroplating chemicals. Catalogue descriptive of Zin-O-Lyte, the new zinc-molybdenum process for bright zinc plating. Bulletin describing Cadalyte, a process and product used in cadmium plating. Catalogue covering materials, equipment, and service for electroplating.

Molybdenum Steel

CLIMAX MOLYBDENUM Co., 500 Fifth Ave., New York City. Publication entitled "Molybdenum in Steel," containing a historical sketch of the development of molybdenum steel, and giving analyses, physical properties, and applications of the various types of molybdenum steels. Full-page illustrations show typical applications of these steels. This publication is a particularly beautiful example of typographical art.

Electric Welding Machines

LINCOLN ELECTRIC Co., Cleveland, Ohio. Bulletin 412, entitled "The New Arc Welding Technique," describing a new "Shield Arc S A E" welding machine of universal application, which is the result of three years of intensive research with the purpose of improving the technique of welding. The various features of the new machine are described in detail and specifications are given.

Crank Presses

NIAGARA MACHINE & TOOL WORKS, 637-697 Northland Ave., Buffalo, N. Y. Bulletin 64-E, covering the Niagara line of double crank presses which are available in a wide range of sizes and capacities. Complete specifications are included. Data is also given on the various styles of clutches provided, which include pin, jaw, fourteen-point engagement sleeve clutch, friction, and air friction types.

Welding Equipment

HARNISCHFEGER CORPORATION, 4536 W. National Ave., Milwaukee, Wis. Bulletin W-9, descriptive of the "Smootharc" automatic welding head. The circular outlines the manner in which welding can be put on a high-production basis with this machine, which is the first of its kind to use standard coated rods successfully. Typical examples of cost-cutting applications are illustrated.

Valve Operators

UNIVERSAL GEAR CORPORATION, 19th and Martindale Ave., Indianapolis, Ind. Bulletin illustrating and describing heliocentric valve operators, consisting of an electric motor, speed-reduction member, automatic release clutch, valve-closing pressure control, opening and closing limit switches, valve position indicator, push-button station, and wheel for hand operation.

Reciprocating Drives

AJAX FLEXIBLE COUPLING Co., 12 English St., Westfield, N. Y. Bulletin 20, illustrating and describing the Ajax reciprocating drive for screens, conveyors and feeders, previously known as the "Shaler Shaker." Sketches are included showing a few of the many applications of these drives, some of which can be applied to equipment already in use.

Factory and Office Sheet Metal Equipment

ROLNICK STEEL EQUIPMENT Co. (Angle Steel Stool Sales Co.), 98-100 Park Place, New York City. Circular illustrating various styles of steel chairs, cabinets, tables, desks, etc. Leaflet showing different types of steel trucks for factory and shop. Leaflet illustrating miscellaneous steel seating equipment.

Noise and Vibration Reduction

KORFUND Co., INC., Long Island City, N. Y. Publication entitled "Isolation," devoted to the study of soundproofing and the isolation of machine vibrations. In addition to information on vibration control, the booklet lists the various types of anti-vibration products made by this concern.

Milling Machines

FREW MACHINE Co., 124 W. Venango St., Philadelphia, Pa. Bulletin 108A, illustrating and describing Frew profile milling machines for profiling and for end-milling pads or other surfaces that are spread over a large area. Specifications are given for the five different styles in which these machines are made.

Air Cylinders

HANNA ENGINEERING WORKS, 1765 Elston Ave., Chicago, Ill. Catalogue 224, covering Hanna air cylinders, containing dimensions, capacities, and illustrations of the different types of cylinders required to meet various installation and mounting requirements.

Steels

TIMKEN STEEL & TUBE Co., Canton, Ohio. Booklet containing information on "Sicromo" steels, a series of silicon-chromium-molybdenum steels notable for high-temperature strength and exceptional resistance to corrosion and oxidation. Analyses of four different types of these steels are given.

Electric Motors

ALLIS-CHALMERS MFG. Co., Milwaukee, Wis. Bulletin 1154A, covering the construction and numerous uses of the Allis-Chalmers coupled and engine type synchronous motors that are applicable for practically any drive of 50 horsepower or over where a squirrel-cage induction motor can be used.

Hydraulic Riveters

HANNIFIN MFG. Co., 621-631 S. Kolmar Ave., Chicago, Ill. Bulletin 39 (erroneously announced as No. 32 in November MACHINERY), describing the exclusive features, advantages, operating cycle, and safety features of the Hannifin "Hy-Power" hydraulic riveters, designed for high-speed noiseless operation.

Cam-Grinding Machines

LANDIS TOOL Co., Waynesboro, Pa. Catalogue C-136, illustrating and describing the Landis 5-inch Type D hydraulic cam-grinder. In addition to containing a general description of the design and operation, complete specifications of the various sizes are given.

Turning Tools

R & L TOOLS, Nicetown, Philadelphia, Pa. Circular on R & L turning tools, showing various applications of the tools as set for drilling and turning, right-hand turning, left-hand turning, and either right- or left-hand turning.

Roll-Grinding Machines

FARREL-BIRMINGHAM Co., INC., Ansonia, Conn. Bulletin 111, describing the design and construction features of the Farrel heavy-duty roll grinder. Complete specifications, including dimensions and weights, are given for the various sizes.

Electric Heating Units

HAROLD E. TRENT Co., 618 N. 54th St., Philadelphia, Pa. Leaflet TC-30, containing information, including price lists, on Trent electric

heating cartridge units, electric tubular heating units, and caterpillar heating units.

Roller Bearings

TIMKEN ROLLER BEARING CO., Canton, Ohio, has just published a new section of its engineering journal covering the application of tapered roller bearings in aircraft. Complete design data is given, including weights.

Nickel-Alloy Steels

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City. Bulletin F-1, containing an article entitled "The Making and Shaping of Alloy Constructional Steels," by E. C. Smith, chief metallurgist of the Republic Steel Corporation.

Variable-Speed Transmission

GRAHAM TRANSMISSIONS, Springfield, Vt. Bulletin 302, illustrating and describing in detail the Graham variable-speed transmission which converts any squirrel-cage motor into a high-torque power unit of infinite speed range.

Cold-Drawn Steels

UNION DRAWN STEEL CO., Massillon, Ohio. Circular entitled "Advanced Steels for Carburized Parts," containing information on the factors that must be considered in selecting steel for carburized parts.

Cemented-Carbide Tools

SUPER TOOL CO., 605 Boyer Bldg., Detroit, Mich. Circular graphically illustrating how the weight of cemented-carbide blanks is calculated for the purpose of determining the price to be charged for blanks.

Metal-Cutting Machines

DE WALT PRODUCTS CORPORATION, Lancaster, Pa. Circular illustrating and describing the De Walt line of metal-cutting machines which employ saw blades or abrasive wheels for wet or dry cutting.

Threading Equipment

OSTER MFG. CO., Cleveland, Ohio. Catalogue covering the complete line of Oster-Williams threading equipment, including stocks and dies, portable and power pipe and bolt machines, and welding jigs.

Forging Presses

CHAMBERSBURG ENGINEERING CO., Chambersburg, Pa. Bulletin 300, describing the construction and method of operation of Chambersburg "United" steam-hydraulic high-speed forging presses.

Micarta

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Booklet illustrating the many industrial applications of Micarta, a plastic material available in various grades and shapes.

Screw Machine Products

BRISTOL CO., Mill Supply Division, Waterbury, Conn. Bulletin 833, covering Bristo screw products, including socket set-screws, socket-head cap-screws, stripper bolts, etc.

Hydraulic Piston Grinders

LANDIS TOOL CO., Waynesboro, Pa. Catalogue D-36 illustrating and describing the Landis 5-inch Type C hydraulic piston grinder. Complete specifications are included.

Packings and Washers

FELT PRODUCTS MFG. CO., 1504 Carroll Ave., Chicago, Ill. Circular showing samples of materials used in making fibrous and metallic gaskets, washers, packings, pads, etc.

Micrometer Dial Gages

B. C. AMES CO., Waltham, Mass. Catalogue 51, illustrating and describing the Ames complete line of micrometer dial gages for measuring, size control, and general testing.

Resurfacers

FLEXROCK CO., 800 N. Delaware Ave., Philadelphia, Pa. Circular descriptive of the Ruggedwear Resurfacer and its application to concrete floors in machine shops and factories.

Microscopes

BAUSCH & LOMB OPTICAL CO., 619 St. Paul St., Rochester, N. Y. Bulletin describing the improved KW wide-field binocular microscope, giving specifications and prices.

Centrifugal Pumps

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J. Circular W-318-B5A, descriptive of Worthington two-stage volute centrifugal pumps.

Electric Furnaces

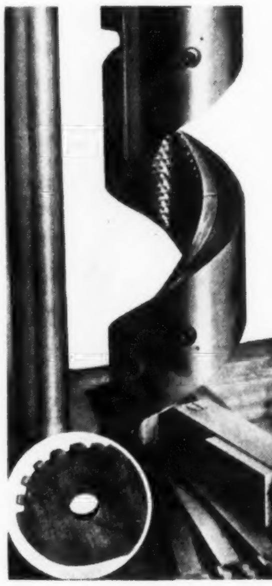
AJAX ELECTROTHERMIC CORPORATION, Trenton, N. J. Bulletin 10, descriptive of Ajax-Northrup oscillator or spark-gap type converters and electric furnaces.

* * *

An Unusual Broaching Job

A manufacturer of steel casement windows designed an operating mechanism embodying a worm and worm-wheel sector, the latter being integral with the operating arm. High production was required. The worm, of course, offered on particular difficulties, but the sector did, since the ten teeth on the sector had to have a helical lead. Ordinary production methods were not suitable.

The problem was solved by the Colonial Broach Co., Detroit, Mich., by designing an internal helical broach for external broaching. It will be noted from the accompanying illustration that the broach itself is helical in shape and is given a helical feed during the broaching stroke. There are two broaches on the machine, which is a standard Colonial hydraulic Utility press, provided with a helical feed head. The broaches conform to the helical broaching holder and are produced in removable segments. Three sectors are broached at one time with each broach, the three pieces being held with a single clamp. With this set-up the production is at the rate of 200 pieces an hour, broaching the teeth from the rough. Both broaches, one left- and one right-hand, cut during the same stroke.



An Unusual Helical Broach for Cutting Gear Teeth in a Worm-wheel Segment

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Madison-Kipp Brass Die-Casting Machines, Hydraulic Pumping Units and Electric Holding Furnaces

Equipment for casting brass and aluminum by the high-pressure method of casting metals in the plastic state is now being placed on the market by the Madison-Kipp Corporation, 203 Waubesa St., Madison, Wis. The experience of Josef Polak of Prague, Czecho-slovakia, well-known European manufacturer of high-pressure brass die-casting machines, has been available to the Madison-Kipp organization for some time, and arrangements have been made with Transforma Aktiengesellschaft, who own many of Polak's latest patents, for exclusive manufacturing license in the United States, Canada, and a number of other countries. The new Madison-Kipp line includes three die-casting machines, five sizes of hydraulic pumping units, and electric holding furnaces of a new design.

All the machines in the new series are fully hydraulic in operation, the Model 256 being shown in Fig. 1. One of the characteristic features of the plastic-metal type of casting machine is that a well is provided in each die for the metal to be cast. This well is made to suit the size of the forcing plunger of the machine, only a small amount of clearance being provided for ease of operation. The

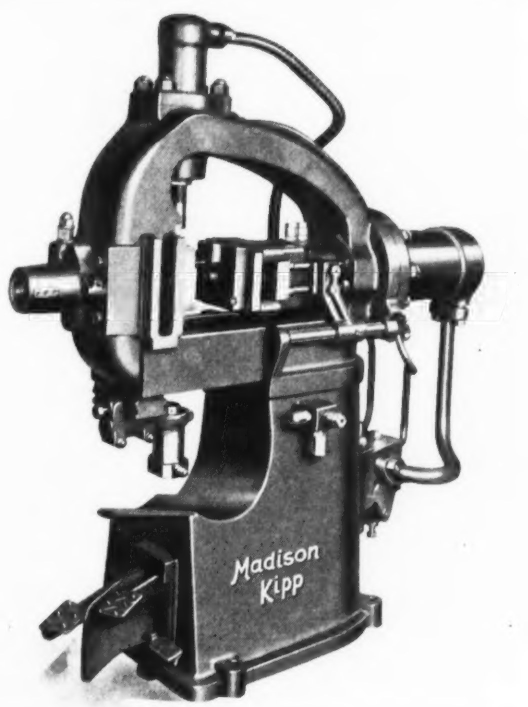


Fig. 1. Die-casting Machine Recently Developed by the Madison-Kipp Corporation for Casting Brass and Aluminum in the Plastic State

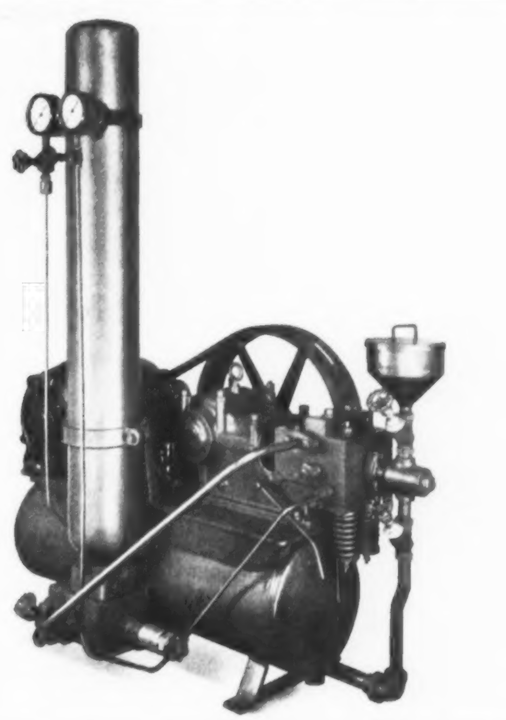


Fig. 2. Hydraulic Power Units have been Developed in Five Sizes for Operating the Madison-Kipp Brass Die-casting Machines

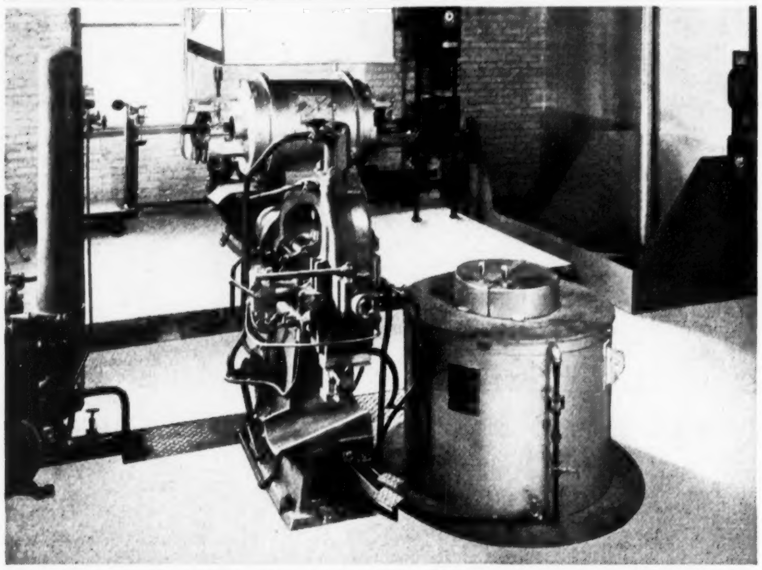


Fig. 3. General View of a Brass Die-casting Department Showing the Die-casting Machine, Hydraulic Power Unit, and the Melting and Holding Furnaces

clearance must vary somewhat with the type of metal to be cast.

Provision is made in the machine for ejecting the casting from either the movable or the stationary half of the die. This gives considerably more latitude than is usual in dies of complicated design. All of these die-casting machines may be equipped with hydraulic core-pulling mechanisms for actuating the cores from either side of the machine or from the bottom of the die. Also, as in the case of the automatic and semi-automatic machines built by the concern for die-casting zinc, aluminum, etc., mechanical core-pulling devices and automatic ejector mechanisms may be applied.

The hydraulic pumping units were designed especially to meet the requirements of the high-pressure plastic-metal casting process. They are self-contained units, as illustrated in Fig. 2, in which the pump, motor, accumulator, water-supply equipment, and controls are compactly assembled.

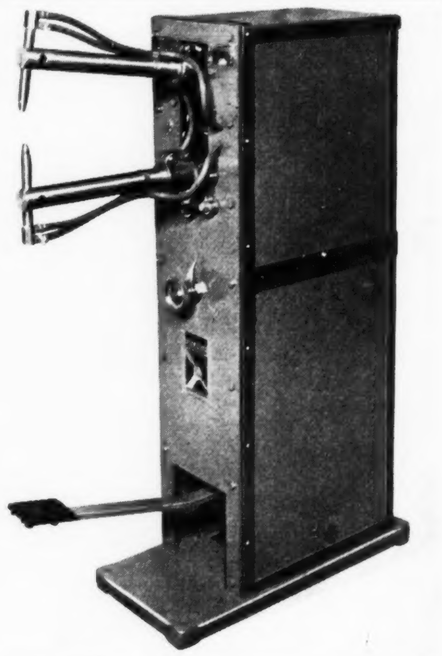
The hydraulic power unit supplied with the Model 256 die-casting machine operates on line pressures up to 2500 pounds per square inch which provide a die-holding pressure up to 30,000 pounds and a pressure of 7700 pounds per square inch on a metal-forcing plunger of standard diameter. Arrangements can be made for higher plunger pressures when necessary, and the operating speed of the plunger can be regulated to suit the casting conditions of various metals and the requirements of special dies. In the larger machines, the metal-forcing pressure may exceed 20,000 pounds per square inch.

The metal to be cast is held in the plastic stage in a furnace of new design. The important features of this new holding furnace are provision for close temperature control when casting metals in the plastic state; rapid heating; minimum radiation loss; and low operating cost. Almost any metal having a plastic range can be cast, but the most practical alloys are Madison-Kipp yellow brass pressure die-casting alloy No. 1; Madison-Kipp manganese-bronze pressure die-casting alloy No. 2; aluminum and magnesium alloys; and the lower temperature metals, which, in certain cases, must be cast under high pressures.

Armglo Production Spot Welder

A completely equipped spot welder of fabricated construction, recently brought out by the Armglo Co., Milwaukee, Wis., is designed to make as many as 2000 welds an hour. This machine has a capacity for welding two pieces of No. 14 gage steel. One of its features is an automatic timer, which insures uniform welds and eliminates rejected work.

The welding pressure can be adjusted by merely setting a nut on the front of the welder. All electrical controls, such as the timer, magnetic contactor, six-point tap changer, and current-carrying parts, are enclosed in the base. The horns are reversible, one end being designed to hold electrodes at right angles, and the other to hold them at a 45-degree angle.



Armglo Spot Welder Designed for Rapid Operation

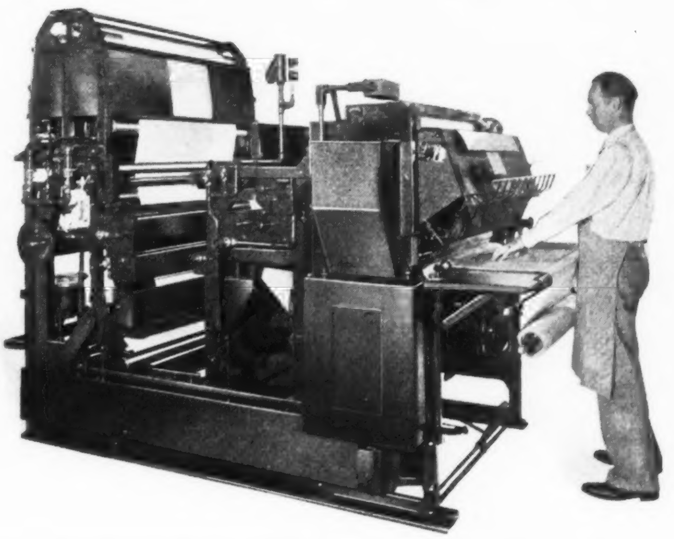


Fig. 1. Pease Continuous Blueprinting Machine Equipped with Gas-heated Dryer

Pease Blueprinting Machines

The continuous blueprinting, washing, developing, and drying machines shown in Figs. 1 and 2 are recent developments of the C. F. Pease Co., 822 N. Franklin St., Chicago, Ill. The Model 27 machine, shown in Fig. 1, is equipped with a gas-heated radiator type dryer, but is also available with an electrically heated type of dryer. The Model 27-D machine, shown in Fig. 2, is equipped with an electrically heated double-drum ironing type dryer, but is also available with a gas-heated dryer.

The blueprinting machines can be had separately or in combination with the washing, developing, and drying equipment in two sizes to accommodate all widths of sensitized paper or cloth up to either 42 or 54 inches wide for reproduction work in cut sheet sizes or for continuous operation.

When it is desired to operate the Model 27 blueprinting machine separately or in conjunction with either the Model 27 or Model 27-D washing and drying units, this can be easily accomplished by means of a simple clutch adjustment. The tracings and paper are fed into the machine and travel upward around a curved segment of highly polished "Trans-Peco" glass, where thorough exposure is accomplished by means of a series of high-power actinic enclosed arc lamps.

In running cut sheet sizes, both the prints and tracings are returned to the tray at the front of the machine after exposure when the prints are to be hand-washed. In operating the machines continuously, the tracings only are returned to the front of the machine, while the prints on the continuous roll of paper travel into the first horizontal water wash, where they are prematurely fixed and cleansed of all "unreduced" sensitizing solution. Following this, they travel downward into the machine and over and around a revolving rubber-covered coating roll, where they are thoroughly developed by means of a uniform application of developing solution. They are then carried upward into a water spray which removes any surplus developing solution.

After the final wash, the prints are carried upward, over, and down around the drying unit, where heat is uniformly applied by the accurately controlled gas or electrically heated elements. The principal difference between the two machines illustrated is in the drying units. These machines will print, wash, develop and dry blueprints, negatives, blue-line or brown-line prints at a speed ranging from 8 inches up to a maximum of 13 feet per minute with the Model 27 equipment, and from a minimum of 8 inches per minute up to a maximum of 14 feet per minute with the Model 27-D equipment.

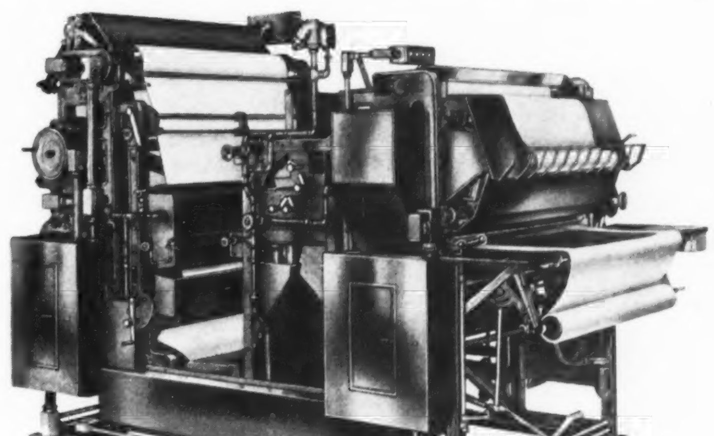
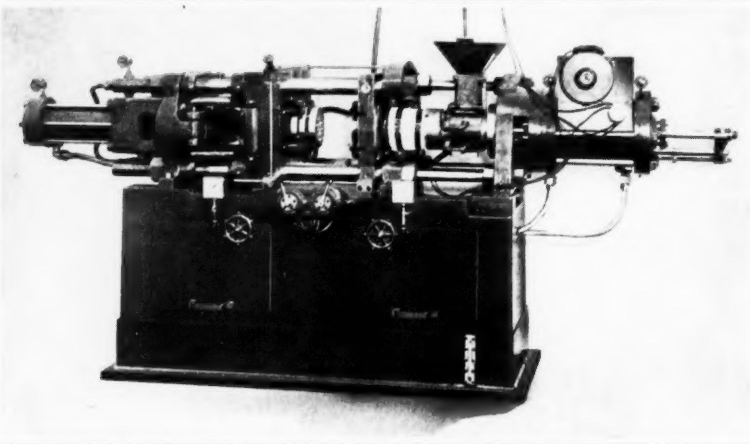


Fig. 2. Pease Continuous Blueprinting Machine with Electrically Heated Dryer



Plastic Molding Machine of Hydraulic Injection Type Built by the Reed-Prentice Corporation

Reed-Prentice Hydraulic Injection Type Plastic Molding Machine

The Reed-Prentice Corporation, Worcester, Mass., builder of machine tools and die-casting machines for zinc, aluminum, and brass, has now brought out an injection molding machine for the plastics industry. This machine can be operated manually or automatically. Manual operation is effected by two levers, one being used for closing the mold, and the other for operating the horizontal plunger.

On the fully automatic machine, two timing control units are furnished, one for controlling the period required for the material to solidify, and the other for regulating the time the molds are open for ejecting the molded parts. These timing units can be adjusted from 0 to 32 seconds.

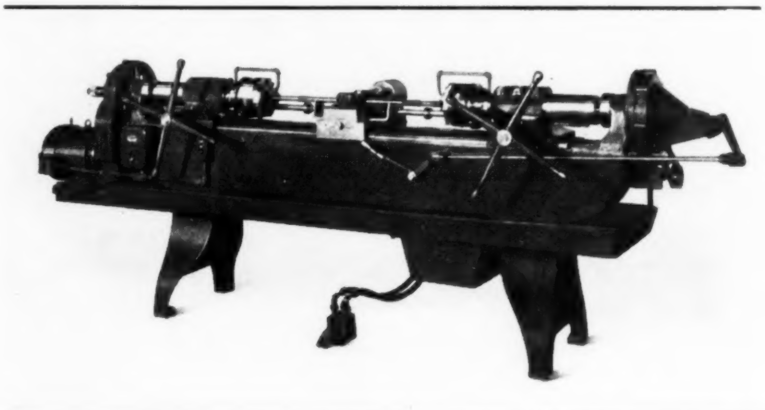
Other features of construction include a positive toggle mechanism for rigidly locking the molds, which does not depend on hydraulic pressure to keep the molds closed. Hydraulic pressure is used only to open and close the molds and to operate the plunger cylinder. The machine is operated by one pump which is driven by a five-horsepower motor having a speed of 1200 revolutions per minute. The base of the machine serves as an oil reservoir for the hydraulic system.

Standard equipment includes a Vickers hydraulic pump with valve control, and an electric heating unit, including the rheostat for controlling the heat of the material. The heating unit is arranged for the use of a thermometer or thermo-couple. An automatic counter can be supplied, if desired. The hopper slide has a capacity for 7 cubic inches of granulated material, and the machine will mold pieces containing 2 3/4 cubic inches of the molded material and weighing 2 ounces. The maximum production capacity of the machine is estimated to be 400 "shots" per hour, the rate varying, of course, with the type of part molded. This gives a capacity for molding 500 cubic inches of material per hour, or 24 pounds per hour.

The maximum pressure per square inch on the material is 20,000 pounds, and the pressure is adjustable from 2000 to 10,000 pounds per square inch. The maximum injection area of the mold is 24 square inches, the stroke is 6 3/4 inches, and the die-plates are 18 by 20 inches. The die opening is 8 inches, the maximum die space 12 inches, and the minimum die space 4 inches.

Murchey Manually Operated Double-End Threading Machine

A double-end, manually operated threading machine designed to thread both ends of a cylinder-block stud having a length of 39 inches is a new product of the Murchey Machine & Tool Co., 951 Porter St., Detroit, Mich. The chuck is operated by means of an air cylinder controlled by a foot-pedal. It is possible to automatically eject the threaded piece and load it on a truck in back of the machine, although in the case of the machine illustrated, the unloading as well as the loading



Murchey Manually Operated Machine for Threading Both Ends of Long Studs Simultaneously

operations are done manually. The machine is equipped with large hardened and ground spindles which operate in pre-loaded roller bearings, and is arranged for individual motor drive. Oil is fed through the head by means of a pump. Hardened and ground self-opening die-heads using tangential chasers with live centers in the die-heads are furnished. This type of die-head facilitates the production of concentric threads.

Cincinnati Self-Contained Cylindrical Grinding Machines

A plain self-contained cylindrical grinding machine has been brought out in two sizes by the Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, with capacities for grinding work 14 and 16 inches in diameter. The machines are built in standard between-center lengths of 18 to 168 inches.

The wheel-head unit is designed to permit reciprocation of the wheel-spindle by means of a hydraulic device. The spindle radial bearings are "load compensating" and require no adjustment when changing from heavy roughing cuts to light finishing cuts, being equally well adapted for both kinds of work. A plain thrust bearing, supported by a cradle type mounting, is located midway between the ends of the spindle.

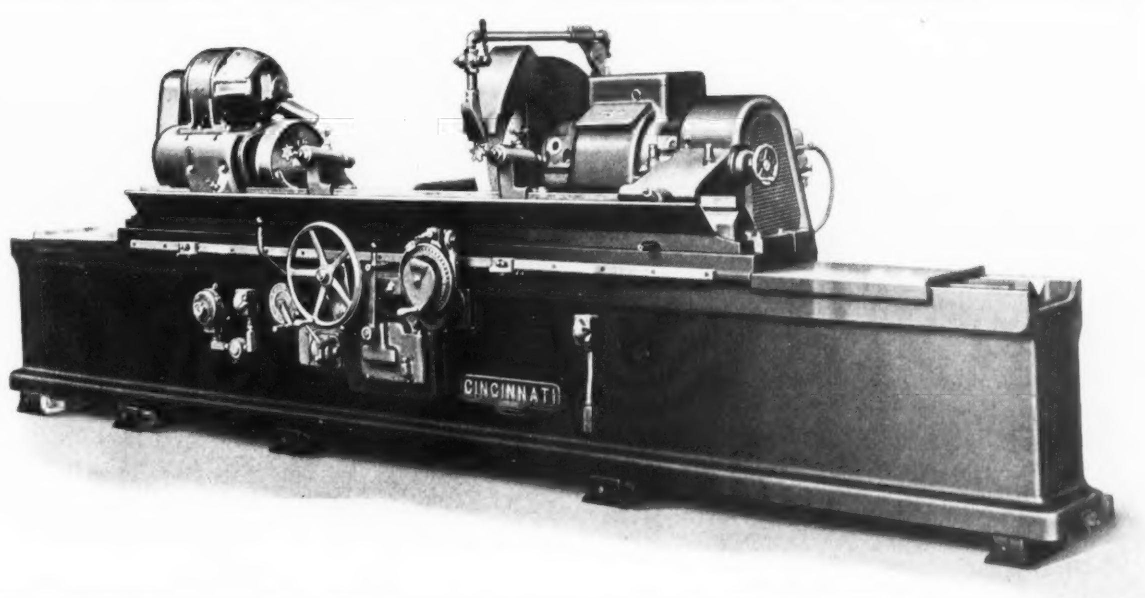
Lubrication of the bearings is entirely automatic. An ample volume of clean oil is circulated under a light pressure by an individual pump. Even before the spindle starts to rotate, normal lubrication is assured by means of a pressure starting switch which will not permit the main motor to start until the bearings are flooded with oil. The main drive motor automatically stops as soon as the oil-pump motor is stopped. Other parts in the wheel-head unit, including its ways on the machine bed, are lubricated by a one-shot system.

Main drive motors of 20 horsepower or less are mounted directly on top of the unit. When a larger motor is used, it is mounted on the floor, as in the case of the machine illustrated. The outboard mounting for the driven sheave permits convenient replacement of the V-belts.

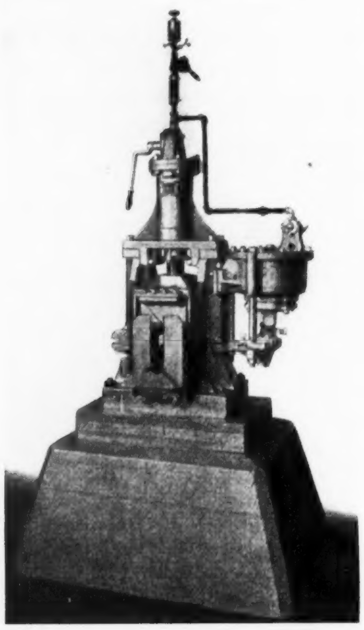
The headstock unit has a new type of drive similar in principle to that of the larger roll-grinding machines. Power is transmitted through V-belts from the motor to the driven sheave and thence through a silent chain to the jack-shaft and faceplate. This unit is independently driven from a direct-current adjustable-speed motor mounted on top of the casting.

Twenty-four work speeds ranging from 40 to 160 revolutions per minute for the 14-inch size, and from 25 to 100 revolutions per minute for the 16-inch size machines are obtained from a rheostat adjustment. The table ways are lubricated by means of a gear pump which draws oil from a reservoir in the machine base and forces it past a low-pressure relief valve to the table ways.

One motor drives the coolant pump and the change-gear unit from which the various table speeds are obtained. This motor is connected to the same electrical circuit as the main drive motor, so that the same switch controls the starting and stopping of both motors.



Cincinnati Cylindrical Grinding Machine Made in 14- and 16-inch Sizes



Rod-straightener Brought out by American Foundry Equipment Co.

American Rod-Straightener and Shear

An improved rod-straightener and shear, designed for the reclamation of rods, bolts, wire, and nails, has been brought out by the American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind. The speed with which this machine operates in both straightening and shearing is limited only by the speed with which the stock is fed into the machine by the operator. The machine is made in all sizes, from a small hand-operated model having a maximum capacity sufficient for straightening rods 1/4 inch in diameter up to the large compressed-air unit, which will straighten rods up to 2 1/2 inches in diameter.

With the exception of the hand-operated model, all of the machines are actuated by compressed air, 60 pounds being the maximum pressure for satisfactory operation. The straightening mechanism is composed of manganese steel dies which close on the rod or bar in the form of a contracting square and deliver an impact or blow on four sides of the work simultaneously. The operation is controlled, and the force of blow is regulated by a hand-lever which actuates the air throttle valve.

Center-Drive Attachment for Fay Automatic Lathe

Both ends of long, heavy shafts and pieces such as rear axle housings can be turned simultaneously on a 20-inch Fay automatic lathe equipped with a center-drive attachment, recently brought out by the Jones & Lamson Machine Co., Springfield, Vt. In Fig. 1 is shown a general view of a 20- by 91-inch Fay automatic lathe equipped with this new drive for use in turning, facing, and forming both ends of a truck rear-axle housing simultaneously. This set-up is for the first operation on the rear-axle housing. The housing is driven by a fixture mounted on the center-drive attachment which engages the banjo portion of the housing. Adjustable bearings are provided in this fixture for supporting the housing as well as for driving it.

The method of chucking the work in the center-drive attachment for the second operation is shown in Fig. 2. During this operation, the housing is held on both sides of the attachment by fixtures that grip the round portion as close to the flange as possible. This eliminates vibration during the machining op-

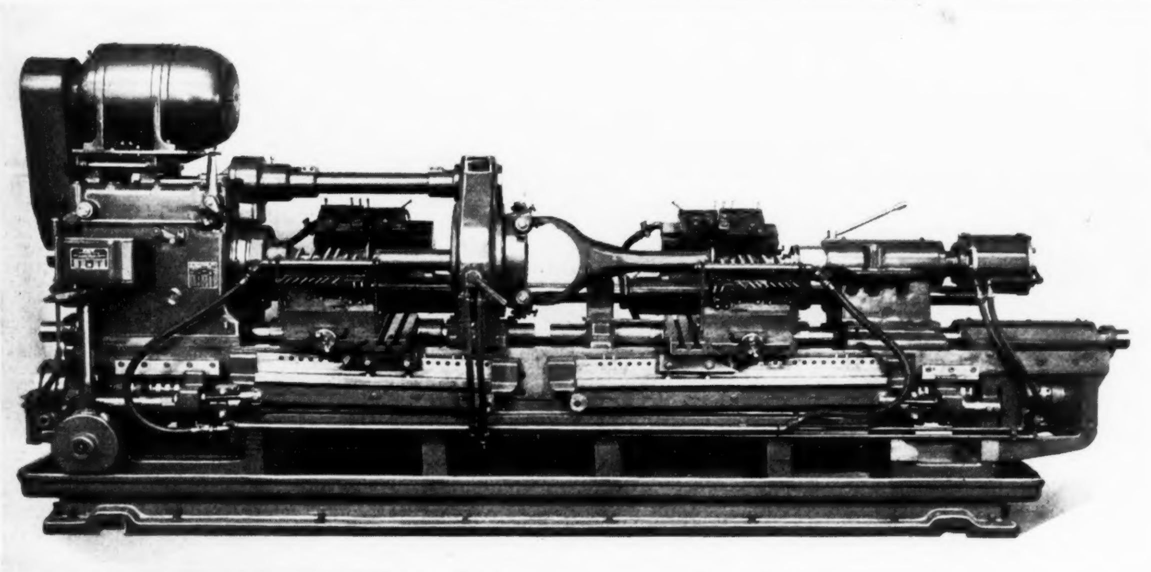


Fig. 1. Fay Automatic Lathe Equipped with Center Drive for Machining Both Ends of Rear-axle Housing Simultaneously

eration. The limits of accuracy and the finish obtained are such that finish-grinding operations have been eliminated. Adjustable clamping devices are employed to avoid springing the work.

The housings are mounted between centers for both the first and second operations, the work being machined in a similar manner in both cases. The headstock center is spring-loaded and adjustable. The tailstock center is mounted in an air-operated ram. A feature of this machine is the mounting of the carriage tool-carrying members on separate center bars which are controlled by cams, so that both carriages feed toward the center of the machine, additional cam space being provided for the tailstock center bar by an extra cam-drum attached to the end of the bed.

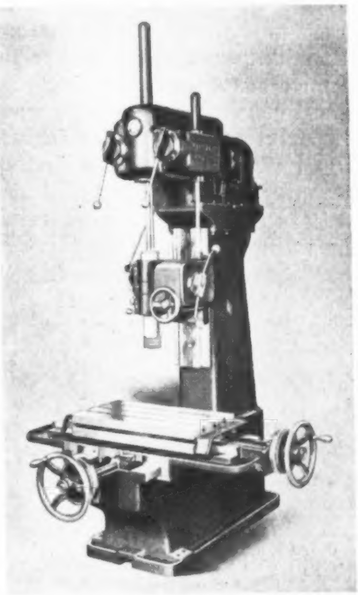
The front former slides are arranged to travel in opposite directions, so that proper relief may be obtained by the turning tools at the end of their cuts. Each carriage carries eight turning tools and two chamfering tools, and each back arm carries five facing tools and one chamfering tool. With a spindle speed of 67 R.P.M., the floor-to-floor machining time is 4 minutes and 5 seconds per housing.

Cleereman Lay-Out Drilling and Boring Machine

A machine designed to fill the gap between the ordinary drilling machine equipped with a compound table and the precision jig-boring machine built to handle work that must be accurate within 0.0001 inch has been developed by the Cleereman Machine Tool Co., Green Bay, Wis. It is being placed on the market by this company's general distributor, the Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill.

The table travel of this machine is accurate in either direction within 0.001 inch. The machine will handle tool, die, jig, and fixture lay-out work where this tolerance is permissible, and it is adapted for experimental and short-run production work where closer tolerances are not necessary.

The direct - reading dials mounted on the lead-screws are 8 inches in diameter and are graduated to 0.001 inch, the graduations being approximately 7/64 inch apart. Scales graduated in sixteenths of an inch for both the longitudinal and latitudinal travel are mounted on the ways to provide means for quickly checking the measurements. Lead-screws mounted in preloaded ball bearings are used to actuate the movements of the table.



Cleereman Drilling and Boring Machine for Lay-out Work

The machine can be furnished with hardened and ground tool-steel lead-screws guaranteed to be accurate within a tolerance of 0.001 inch in 2 feet, in place

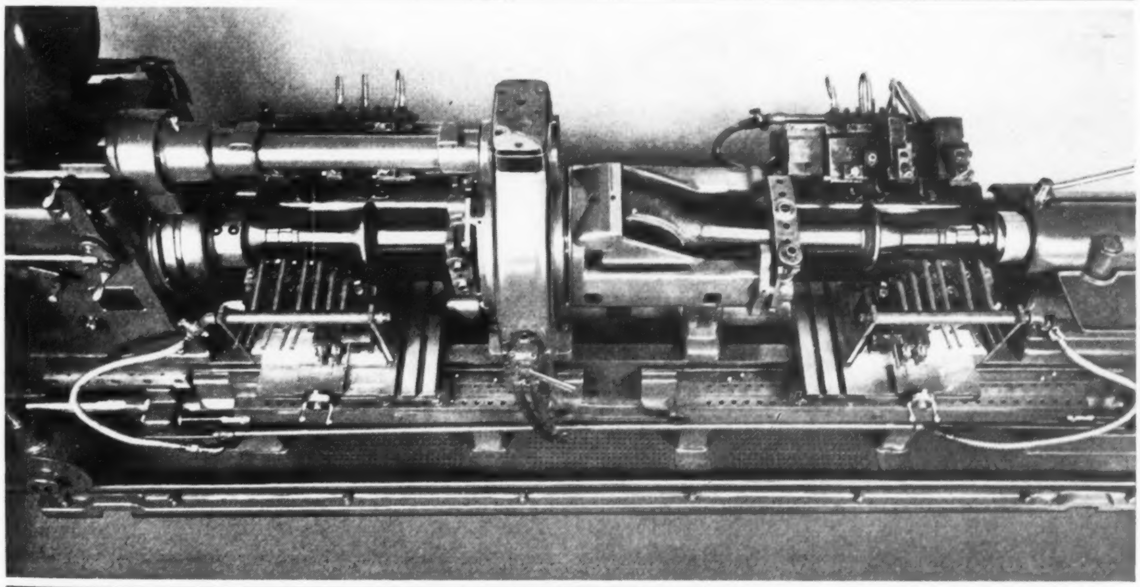


Fig. 2. Set-up Used on Lathe Shown in Fig. 1 for Performing Second Operation on Ends of Rear-axle Housing

of the cut lead-screws, which provides the most direct method of making settings. A second arrangement that can be furnished consists of precision end-measuring instruments, including built-in dial indicators accurate within 0.0001 inch; 1-inch inside micrometers reading to 0.0001 inch; and precision end-measuring rods in lengths of 1, 2, 3, 6, and 12 inches. The hardened and ground lead-screw can also be supplied with this arrangement.

Toledo "Die-Spotting" Press

A "die-spotting" press for use in the final fitting or spotting of the formed surfaces of large drawing and forming dies has been brought out by the Toledo Machine & Tool Co., Toledo, Ohio.

The new press is arranged for individual, direct-connected motor drive, the motor being a reversible, variable-speed, high-torque type. The slide is adequately gibbed to maintain accurate alignment, and has drilled holes for attaching the dies. The bed is 160 inches by 140 inches and there are five T-slots for clamping purposes.

Two screw-operated pushers are driven by an electric motor through a clutch that permits the movement of the pushers to be reversed. Limit switches stop the slide travel at the extreme top and bottom positions. The press has ball bearings throughout, the gear-boxes are all self-lubricated, and the screws have a telescoping cover to protect them from dirt and grit. A planer type table can be furnished if desired. If higher pressure is needed, the presses are furnished with hydraulic operating cylinders in place of the screws.

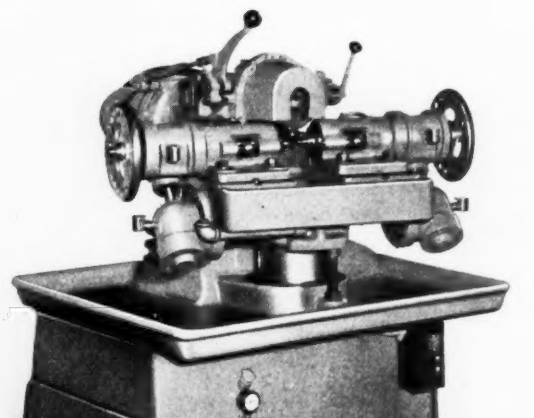
"Rutac" Rotary Universal Tooth-Chamfering Machine

A machine for chamfering the ends of the teeth of helical gears and pinions, spiral-bevel gears and pinions, and the sharp corners at the ends of spur gear teeth has been brought out by W. C. Lipe, Inc., Syracuse, N. Y., under the trade name of "Rutac." This machine is capable of chamfering teeth at the rate of from 300 to 600 teeth per minute. It is so constructed that any type or size of gear within its range can be handled by merely changing the timing gears and the work-holding equipment, and resetting the machine according to a set-up chart. The work is held in place by an air-operated fixture.

The ends of the teeth are burred at the same time that the chamfering operation is performed by means of a specially designed tool which is automatically withdrawn from the work to facilitate loading and unloading. Thus one operation accomplishes work previously requiring two operations.

After the gear being chamfered and burred has passed through one cycle or one and a fraction of a revolution, the motion of the work- and cutter-spindles is automatically stopped

Toledo Press for Use in Fitting Formed Surfaces of Large Dies



"Rutac" Tooth-chamfering Machine Brought out by W. C. Lipe, Inc.

by operating a multiple disk clutch, which disengages the drive from the motor. The motor is controlled by a manually operated push-button.

Safety for the operator is provided by having the control levers so arranged that both hands must be removed from the work and the vicinity of the cutter blades in starting the machine. All inaccessible bearings are lubricated by means of an oil pressure system which is operated automatically each time the machine is stopped and started.

The machine will burr and chamfer gears having from five to sixty teeth of any diametral pitch from 4 to 20 and with face widths up to 2 inches. Gears with outside diameters ranging from 1 inch to 8 inches can be handled, and even smaller gears having shanks can be accommodated. The cutter-spindle speeds range from 300 to 600 revolutions per minute. A complete change in set-up can be made in from 1 to 1 3/4 hours, depending upon the type of work. The time required for loading and unloading averages about eight seconds.

Lincoln Electrode for Welding Chromium Steels

A coated electrode known as "Chromeweld 4-6" has been developed by the Lincoln Electric Co., Cleveland, Ohio, for use in welding the 4-6 per cent chromium steels. These steels are used in applications requiring resistance to crude oil corrosion at high temperatures and pressures. The welding of superheater headers and similar applications are also facilitated by the use of this electrode. It is made in three sizes, 1/8, 5/32, and 3/16 inch in diameter.

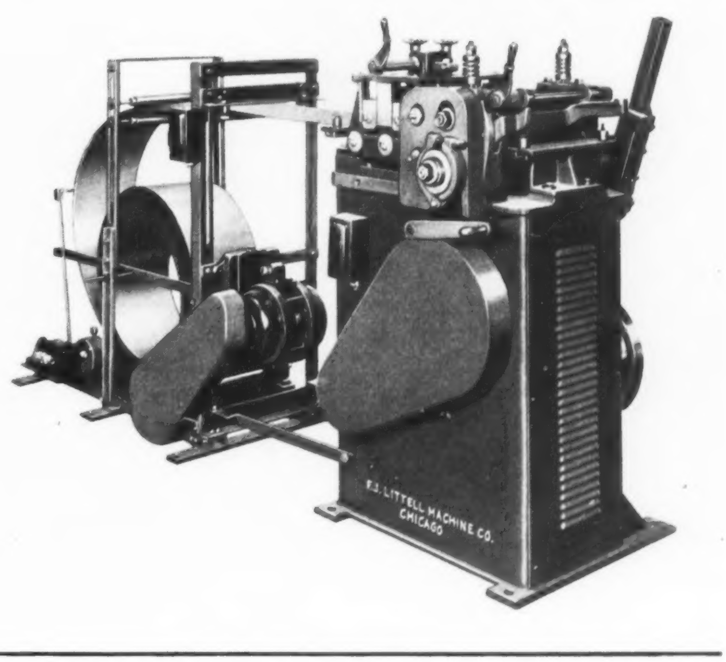
The resistance of the 4-6 per cent chromium steels to sulphide corrosion is four to ten times that of ordinary steel, and the resistance to oxidation at 1000 degrees F. is three times as great. Such steels, welded with the new electrode, can be softannealed to obtain physical properties similar to those of mild carbon steel. When thus treated, they are suitable for equipment where severe cold working is applied during fabrication.

Littell Machine for Straightening and Feeding Coiled Stock

A machine that is designed to straighten and feed coiled stock to double-action presses of the cam or toggle type has been added to the line made by the F. J. Littell Machine Co., 4127 Ravenswood Ave., Chicago, Ill. In cases where double-action presses are used in such a way that a fully automatic feed is impracticable, this machine is so arranged that it will feed the required amount of stock into the press each time that it is tripped. An intermittent feeding unit which can be tripped by the operator is usually employed.

With the feeding unit illustrated, the operator trips the unit with his left hand. The strip is then fed forward very quickly, the press is tripped, and the operator picks out the work from the die. It is claimed that this feeding and straightening machine enables production to be increased from 50 to 100 per cent and that it permits handling finished parts without marring the surface. The machine is driven by its own motor and has a clutch similar to that of a punch press, so that it makes only one revolution when tripped. It is mounted on a welded-steel base, is self-contained, and can be moved to any press.

The feeding machine is provided with a five- or a seven-roll straightener. The type of straightener required depends on the width and thickness of the material. A power-driven stock reel is used, so that the feed is always from a loop of the material. The reel is equipped with an automatic shut-off to prevent the loop from becoming too large. Either a cradle reel or an automatic centering reel can be used, depending on the weight of the coils.



Coiled Stock Straightening and Feeding Machine Brought out by the F. J. Littell Machine Co.

Brown & Sharpe "Omniversal" Milling Machine with Extra Milling Head

The "Omniversal" milling machine described in September, 1935, MACHINERY, page 45, which is built by the Brown & Sharpe Mfg. Co., Providence, R. I., is now being equipped with an extra milling head. This new Omniversal milling head greatly increases the range and versatility of the machine. Another improvement is the provision of means for synchronizing the knee-slide feed and the headstock spindle rotation for milling spirals. In addition to the fundamental movements and adjustments common to the universal milling machine, the Omniversal has an angular adjustment of the knee in a vertical plane at right angles to the spindle, and a horizontal feed of the entire knee assembly in the same plane.

The new milling head, which is adjustable parallel to the main spindle, has a spindle that can be set accurately to any angle in either a horizontal or vertical plane. This provides an easy and accurate means of obtaining both simple and compound angular settings in any plane; and work can often be milled in a number of planes, or drilled, bored, or reamed at many different angles without the use of special fixtures or attachments, and without relocating the work in the holding device.

The Omniversal milling head, as shown in Fig. 1, is mounted on the left side of the machine column, where it is readily available for use. In general, this head has four types of adjustment, the possible combinations being as follows: (1) It may be used either in its normal position at the left side of the column, or in either of the over-arm holes. (2) The head may be adjusted transversely, that is, parallel to the over-arms throughout a range of 14 inches when used on the left side of the column. This range is 5 7/8 inches when used in either over-arm position. (3) The head has universal angular adjustment, and the spindle can be set at any angle in a horizontal or vertical plane by verniers reading to two minutes of arc. (4) The spindle itself has a 2-inch axial hand feed, and may be clamped in position at any point in its travel.

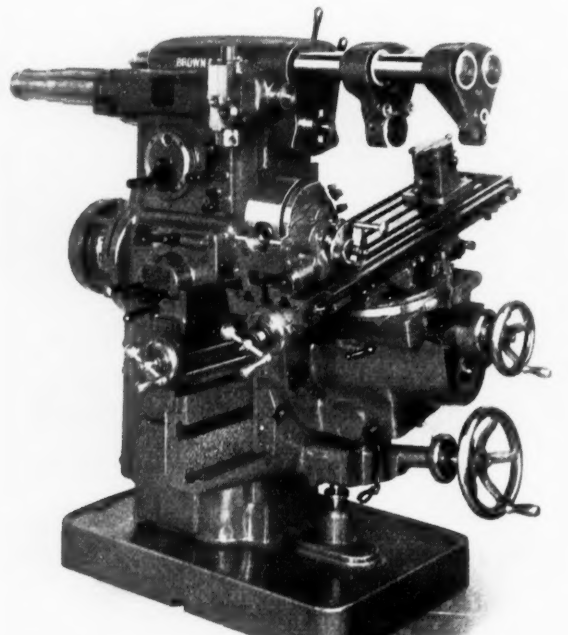


Fig. 1. B & S "Omniversal" Milling Machine with Extra Milling Head

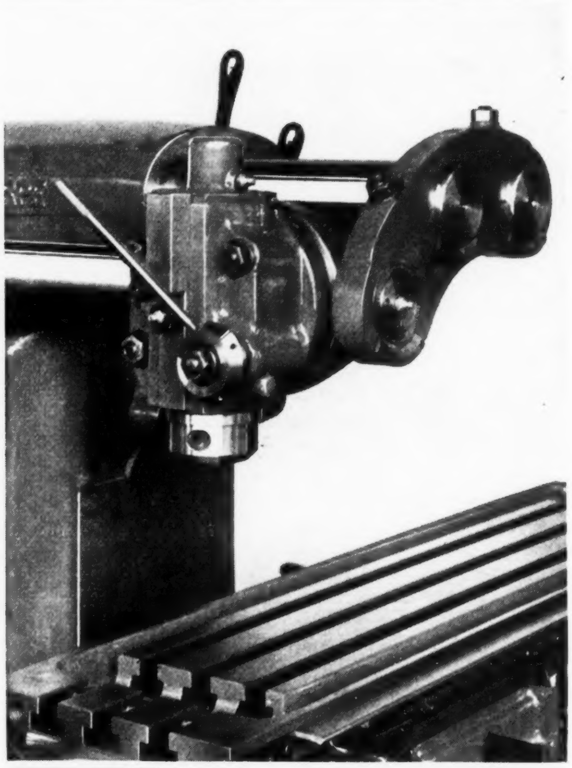


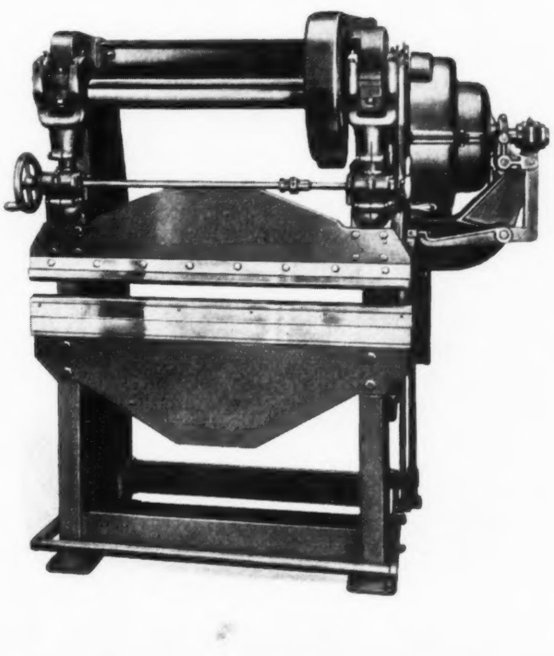
Fig. 2. Close-up View of Extra Milling Head Developed for "Omniversal"

The milling head spindle is gear-driven from the rear of the machine spindle in all positions, and has a speed range of 88 to 2860 revolutions in approximately a 2 to 1 ratio with the machine spindle speeds. When desired, cutters can be used simultaneously in both the milling head spindle and the machine spindle. When the machine spindle only is to be used, the drive is disengaged from the milling head by a lever.

Whitney-Jensen Press Brakes for Making Right-Angle Bends

A 4-foot No. 47 power press brake that will make right-angle bends in 14-gage mild steel in lengths up to 4 feet has been brought out by the Whitney Metal Tool Co., Rockford, Ill., for both jobbing and production operations. The housings and bedplate are fabricated of plate steel reinforced with truss rods. The speed can be adjusted from twenty to fifty-four strokes a minute. The motor has an electric reversing arrangement for withdrawing the ram by power in case of incorrectly adjusted or jammed dies.

Another recent development of this company is an "Air-Conditioning Combination Special" bending brake, designed to facilitate the fabrication of ducts and other sheet-metal work used in air-conditioning systems, warm-air heating installations, etc. This machine has a capacity of 49 inches and will bend 20-gage metal. It has the same features as the "Air-Conditioning Special" described in April MACHINERY, page 558, but is equipped with fingers adapted for box and pan bending.



Whitney-Jensen Press Brake for Making Right-angle Bends

Improved Radiac Cut-off Machine, Brought out by A. P. de Sanno & Son

The ram consists of a single plate 2 inches thick and 12 inches wide.

The machine is double back-geared and is driven by a three-horsepower motor, which is mounted on the right-hand upright, together with the flywheel, clutch, and all control linkages. The over-all length of the die surface is 50 inches, and the clear distance between the housings is 37 inches. The throat clearance from the center of the dies is 6 1/2 inches. The stroke is 2 1/4 inches and the ram has an adjustment of 3 3/4 inches.

Improved Radiac Cut-Off Machine

An improved model of the Type J Radiac cut-off machine has been brought out by A. P. de Sanno & Son, Inc., 1615 McKean St., Philadelphia, Pa. This improved machine has the water tank, the centrifugal pump, and the overload relay box for protecting the motor, together with the piping, enclosed in the base. The table, which supports the vise, has been strengthened to insure freedom from vibration. The cutting capacity has been greatly increased by locating the base casting supports directly under the vise. A fourteen-gallon tank for the cutting coolant is supplied in place of the eight-gallon tank used on previous machines.

The water or coolant is directed on the work by jets located on both sides of the wheel. Another jet of water is directed on the work from below the vise. A smaller belt guard is employed, which improves the appearance of the machine. The shaft on which the cutting head swings

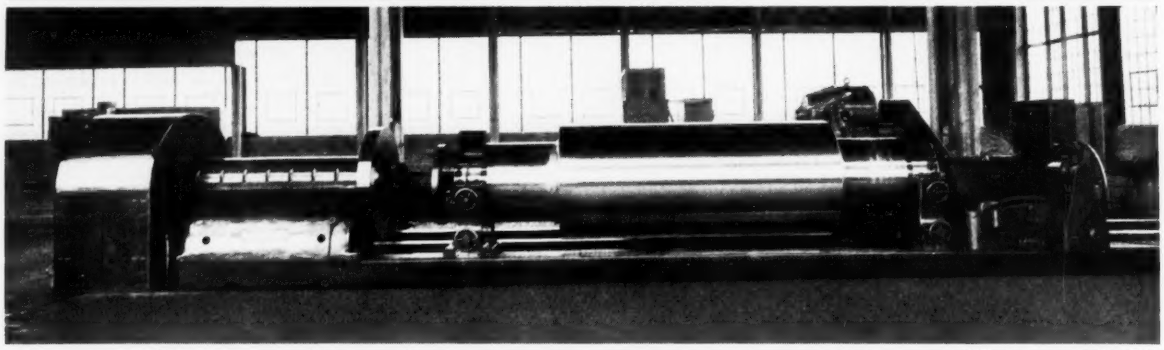


Fig. 1. Front View of Landis 60-inch Swing Roll-grinder

is protected on both sides from abrasives and dirt by dust-caps. The front and rear ventilating panel in the base can be removed for cleaning the tank, which is drained by removing a plug.

Electric Plug with Locking Arrangement

An electric plug for making connections with regular outlets, which has prongs that can be locked to the socket or outlet, is being manufactured by the Hy-Duty Products Co., 1803 S. Hope St., Los Angeles, Calif. This plug has been developed especially for use in machine shops where the electrical connection is through a plug and cord. It is particularly adapted for use with portable grinders and drills, etc., in which the cord is likely to be accidentally pulled from its socket. The plug is made to grip the socket tightly by simply pushing in a locking ram. Withdrawing the ram releases the plug.

Landis 60-Inch Swing Roll-Grinder

A roll-grinder having a 60-inch swing and a capacity of 26 feet between centers has recently been placed in operation by the Landis Tool Co., Waynesboro, Pa. This is the largest roll-grinder ever built by this company. Its net weight is well over 90 tons and it will handle rolls weighing up to 75 tons. The machine is equipped with nine separate electric motors. These motors have a total of more than 113 horsepower and range in size from 1/4 to 60 horsepower. The headstock and footstock spindles are 12 inches in diameter. The grinding spindle bearings are 6 inches in diameter and 14 inches long. The weight of the grinding-wheel head is about 8 tons.

This type of machine is available in 36-, 48-, 52-, and 60-inch swings, and in lengths ranging from 10 to 26 feet between centers, depending upon the swing. Some of the more important features include control from an operating platform on the traveling wheel carriage, from which point all machine movements can be controlled, always with the point of contact between the wheel and work in plain view; multiple V-belt drive to the headstock, with the drive located in a pit, which prevents transmitting vibration to the machine bed.

The grinding-wheel spindle has large babbitt-lined steel bearings, flood-lubricated with filtered oil by means of a special lubricating system which will not permit the wheel-spindle driving motor to start until the pump drive motor has raised the pressure in the oil line to a certain predetermined amount. A crowning and concaving mechanism of the adjustable crankpin type which causes the wheel to grind symmetrical and accurate contours is provided. The wheel carriage ways, the traversing mechanism, the work-spindle, and the grinding wheel have flood lubrication.

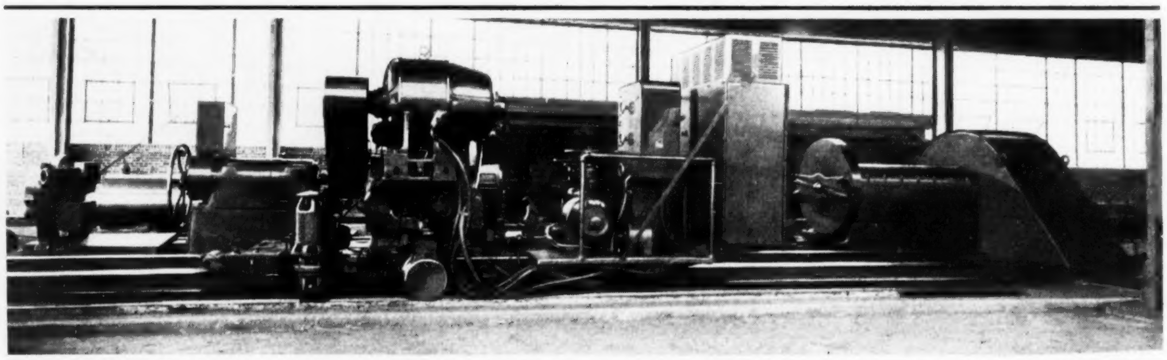
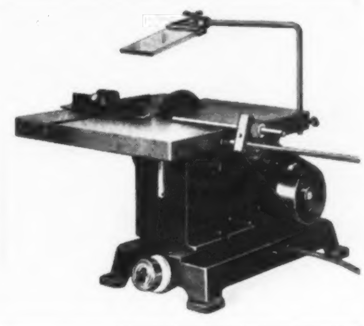


Fig. 2. Rear View of Roll-grinder Shown in Fig. 1

"Little Wonder" Wheel Dressing Fixture Made by Luther Mfg. Co.



Challenge Cut-off Machine for Cutting Stock up to 1 Inch Thick

"Little Wonder" Radius Dressing Fixture

The dressing of wheels for radius grinding can be quickly accomplished with the fixture shown in the accompanying illustration. This radius dressing fixture is the latest addition to the line of fixtures made by the Luther Mfg. Co., 58 Knecht Drive, Dayton, Ohio. It is so designed that it can be easily set for accurate dressing to the required radius. The illustration shows how the fixture is held in place on the magnetic chuck or table of the grinding machine.

The frame and the arm of the fixture are of semi-steel, normalized to prevent distortion. The arm rests in hardened and ground adjustable centers. It operates without chatter and maintains its accuracy even under severe use. The required setting is easily obtained by measuring the distance from the end or point of the diamond to the end of the setting sleeve with a micrometer. The fixture can be set for concave or convex forming to any radius from 0 to 1 inch.

Challenge Abrasive Cut-Off Machine

An abrasive cut-off machine designed to cut any hard or soft metal of tubular or solid form has been brought out by the Challenge Machinery Co., Grand Haven, Mich. It is claimed that this machine will cut hardened tool steel easily and quickly. It has a capacity for cutting material up to 1 inch in thickness. The adjustable table is 15 by 14 inches. Conveniently located and easily adjusted gages are provided.

The machine is equipped with a 6- by 1/36- by 1/2-inch elastic cut-off wheel, and has a precision ball-bearing spindle. It can be operated by making connection with any lighting socket. The machine is furnished either with or without a steel stand.

General Electric Low-Range Direct-Current Arc Welder

A low-range, direct-current welder, utilizing rectifier bulbs, has been developed by the General Electric Co., Schenectady, N. Y. This welder is designed to operate on three-phase, fifty- or sixty-cycle power, 330, 440, or 550 volts, and uses four mercury Tungar bulbs for rectifying the alternating current to obtain direct current.

The welder has ample capacity for welding all light-gage car or truck parts, and is adapted for construction and maintenance work. It can also be used to fabricate metal roofs an ceilings, steel cabinets, blower and ventilating systems, and steam fittings. The welder is light in weight, portable, and has a current range of from 25 to 75 amperes, which is controlled by a nine-point tap switch. The equipment weighs 140 pounds, and is mounted on hard rubber casters to facilitate moving. The over-all dimensions are 27 by 24 by 14 inches.

Dodge Demountable-Rim Sheave for V-Belt Drives

A demountable-rim type sheave for V-belt drives, which consists of a hub on which rims of different diameters and numbers of grooves can be mounted, has been brought out by the Dodge Mfg. Corporation, Mishawaka, Ind. The rims can be mounted in four different positions, so that the hub may be centered in the sheave or have varying amounts of offset, as required.

This sheave, which is desig-

General Electric Low-range Arc Welder with Rectifier Bulbs

Dodge Demountable-rim Sheave for V-Belt Drives

nated the Type DR, is particularly adapted for installations requiring occasional variation of speed or horsepower. The hub is mounted permanently on the motor, engine, or machine shaft, and the rims can be changed as often as required.

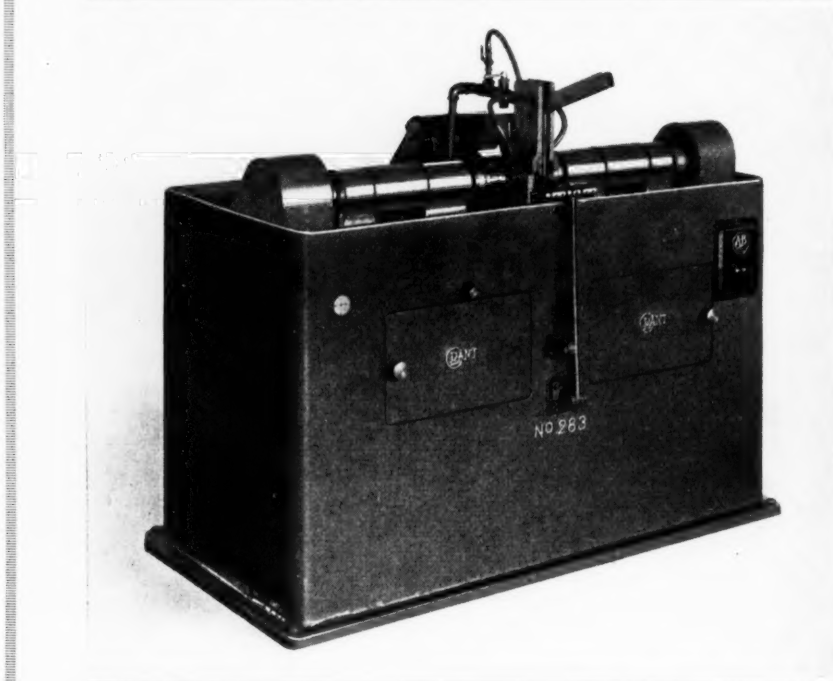
The selected range of diameters and numbers of grooves will take care of most requirements, but in some cases it may be necessary to make a slight change in the drive ratio in order to use a regular DR sheave.

Grant Double-End Automatic Chamfering, Facing, and Burring Machine

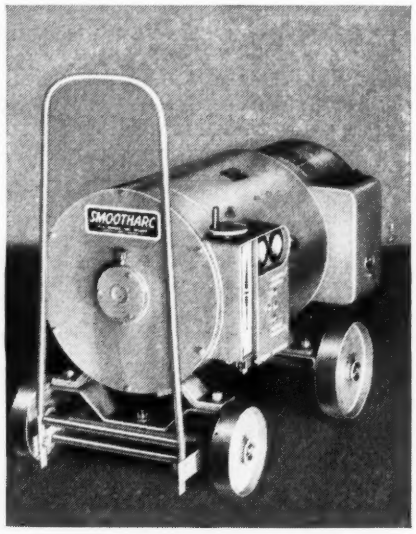
A double-end automatic chamfering, facing, and burring machine has recently been brought out by the Grant Mfg. & Machine Co., Bridgeport, Conn., that will handle work up to 2 1/2 inches in diameter and from 3/4 inch to 6 inches long. The machine illustrated is set up for finishing both sides of 1 1/4-inch nuts. The nuts are placed in the magazine, from which they fall by gravity into feed-fingers, in which they are automatically clamped for the machining operations. After being machined, the finished parts are automatically ejected.

The machine spindles are made from chrome-nickel steel, heat-treated, and run in bronze bearings. The bearings on each spindle are over 16 inches long. There are fine adjustments for the spindle movements. The cams are of the drum type with removable plates, and the camshaft has a safety feature to prevent breakage. Change-gears are provided for both spindle speeds and feeds.

The machine is equipped with a silent chain drive from the motor to the spindles. All bearings are automatically oiled with forced feed lubrication. Provision has been made for the use of a detachable crank at the front of the machine for operating it by hand when setting up the tools.



Grant Double-end Automatic Chamfering, Facing, and Burring Machine



"Smootharc" Welder Brought out by the Harnischfeger Corporation

P & H "Smootharc" Welders

A line of "Smootharc" welders featuring simplified design, not only in outward appearance but also in operation, has been brought out by the Harnischfeger Corporation, 4536 W. National Ave., Milwaukee, Wis. These welders have the features of a single current control, self-excitation, and internal stabilization. They are built in both vertical and horizontal types for stationary or portable mounting. The vertical units are made in three sizes—75, 100, and 150 amperes—while the horizontal units are available in 200-, 300-, 400-, an 600-ampere capacities. The horizontal units are streamline an present a neat compact appearance, as shown in the illustration.

A micrometer screw provides means for shifting the brushes to give an infinite number of current settings. The voltage regulation is automatic and requires but a turn of the handwheel control to adjust the welding current. All welders of this line are internally stabilized by a patented winding. Quick arc recovery is secured through the combination of short circuit winding and a magnetic bridge located in the main field magnetic circuit.

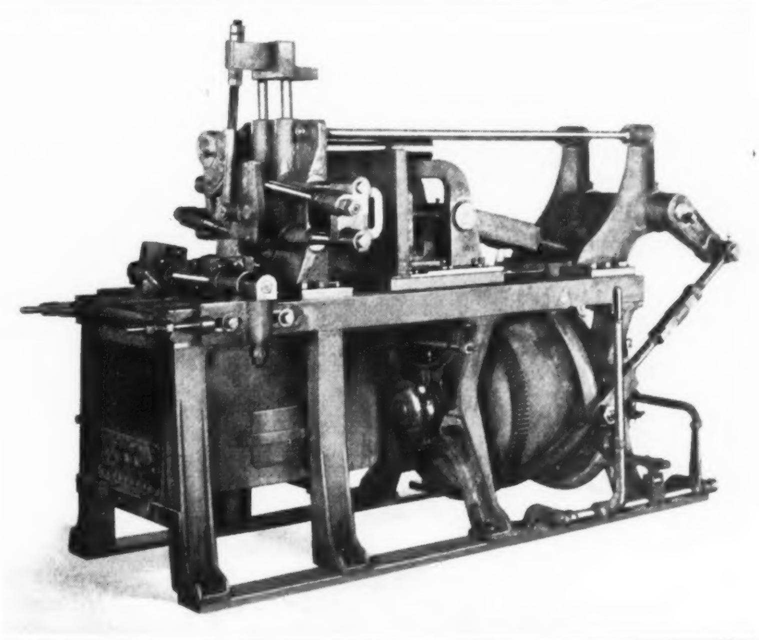
Other improvements include a single control panel built into the side of the generator frame. The alternating-current motor starting box is built into the side of the motor housing.

Nord Die-Casting Machine

A die-casting machine especially adapted for casting aluminum alloys, zinc alloys, and metal of high tensile strength has been developed by the Nord Tool & Machine Co., 7444 Madison St., Forest Park, Ill. One main cam is employed to operate all movements of the machine automatically in their proper sequence. The metal injector is so constructed that it dips to the bottom of the metal pot, where it picks up the heaviest and purest metal. This action prevents dross from entering the injector and thus eliminates the cause of surface marks.

Cores are pulled automatically in two or three directions, depending on the construction of the die itself. The main die slide is operated by means of an adjustable bellcrank. The slide is so constructed that it opens at a very slow speed, the speed increasing as the die moves back for the ejecting action, which is obtained by means of a short lever acting in conjunction with the bellcrank. An automatic sliding hood covers the die during the casting period and protects the operator.

The machine can be run at a reduced speed of 10 revolutions per minute for zinc castings and at 7 revolutions per minute for aluminum. Five burners are provided. The temperature can be raised to 1300 degrees F. in two hours for producing aluminum castings, while only 1 1/2 hours is required to reach the temperature necessary for zinc castings. After the machine is brought up to the casting temperature, only one burner is required to maintain the proper casting temperature. A heat control pyrometer with automatic shut-off valve can be furnished if desired. The opening for the dies is 16 by 18 by 24 inches. The machine is 85 inches long, 40 inches wide, and 60 inches high.



Nord Die-casting Machine for Producing Aluminum and Zinc Alloy Castings

Instrument for Determining Dust Content of Air in Plant

Bausch & Lomb Dust Counter

A dust counter that includes in one unit all the necessary air sampling equipment for determining the degree to which health is endangered under dusty conditions has been developed recently by the Bausch & Lomb Optical Co., 619 St. Paul St., Rochester, N. Y. This new equipment includes a dark field microscope viewing and counting system. No accessory laboratory equipment is needed. The complete outfit weighs but 12 1/2 pounds.

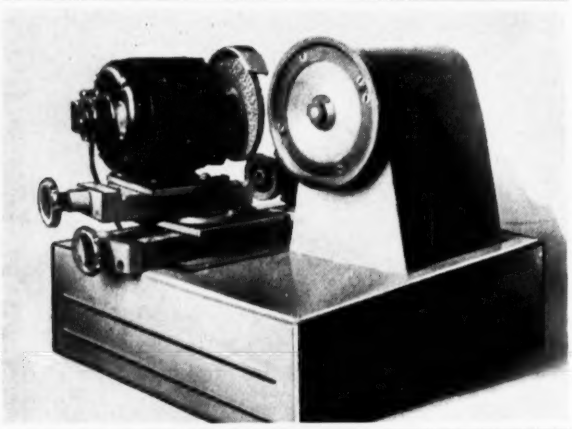
In taking a sample of dust-laden air, there is nothing to set up. The operator simply enters the room and leaves in less than fifteen seconds without interfering with the manufacturing routine or interrupting production. No skill or technical supervision is required to make daily or hourly tests to insure adequate protection.

Condor Compensated Belt Designed to Equalize Ply Stresses

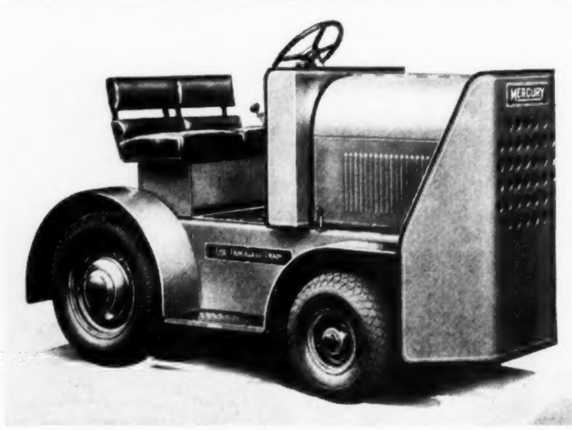
Two new styles of Condor compensated belt, in which the principle of equalized ply stresses at the arc of contact is incorporated, have been developed by

the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. These belts are especially designed to meet those unusual conditions that require some slip rather than the high coefficient of friction generally desired for low-tension operation, for which the regular compensated belts of this company's manufacture are particularly adapted.

The Style F belt has a red friction pulley surface and is designed for use where a slight slip is desired in starting, while the Style B has an untreated duck pulley surface and is intended for use where conditions call for a greater amount of slip. The patented Condor compensated principle of equalized ply stresses consists of building the belt to conform to the pulley curvature, thereby eliminating excessive stresses on the outer plies. This feature prevents rupture or separation of the plies, eliminates breakage of fasteners, and prolongs the belt life.



Samuel C. Rogers & Co.'s Circular Cutter Grinder



"Huskie" Tractor Made by the Mercury Mfg. Co.

Rogers Circular Knife Grinder

A bench type grinder for sharpening single- or double-bevel knives or disks has been brought out by Samuel C. Rogers & Co., 191-205 Dutton Ave., Buffalo, N. Y. This machine can also be obtained in a floor type. The No. CC-1 size will sharpen knives up to 14 inches in diameter, while the No. CC-2 will sharpen knives up to 20 inches in diameter.

The knife is revolved by a separate motor drive through a V-belt which imparts a smooth rotating movement during the grinding process. The knife is mounted on an adjustable arbor designed to hold either solid circular knives or knives made in two sections. Suitable flanges are provided for supporting thin knives or knives of smaller diameter.

The diamond wheel is 6 inches by 1/2 inch and is provided with a guard. An 8-inch wheel, however, can be obtained on special order. The wheel is mounted directly on the arbor of a 1/4-horsepower, ball-bearing motor, on which provision has been made to eliminate end thrust. The entire grinding wheel and motor assembly has a double adjustable slide mounting. A graduated index is provided for obtaining any degree of bevel.

"Huskie" Industrial Haulage Tractor

A four-wheel tractor capable of handling large trailing loads and adapted for indoor or outdoor operation has recently been added to the line of industrial haulage units made by the Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill.

This tractor, known as the "Huskie," is available with either pneumatic or solid tires. It is powered with a four-cylinder Ford engine and has a four-speed truck type transmission and clutch. The length, excluding the coupler, is 96 inches, the width 48 inches, and the wheel base, 54 inches; the turning radius is 108 inches. This tractor is capable of developing a pull of 3000 pounds on the draw-bar, and will travel at speeds up to 10 miles per hour.

"Giant Grip Junior" Alternating-Current Welder

A welder known as the "Giant Grip Junior" has been brought out for the low-priced field by the Giant Grip Mfg. Co., Oshkosh, Wis. There are four models, covering a capacity range of from 90 to 300 amperes. These welders are lighter in weight than the standard line of this concern, due to the wood construction of the cabinets and the arrangement of the amperage control.

There are only ten controls in two of the models and sixteen controls in the other two, while the standard welders have twenty-seven and thirty-six controls. These welders are easy to op-

Alternating-current Welder Produced by the Giant Grip Mfg. Co.

erate, each being equipped with a rotating knife switch control, on which the amperage is distinctly marked to indicate each step in welding. The welders can be used on grounded systems and can be employed for thawing out water pipes.

Hanna Electric-Hydraulic Riveter

Hanna Engineering Works' Electric-Hydraulic Riveter

An electric-hydraulic riveter consisting of a motor-driven primary pump, a valve mechanism and an intensifier has been placed on the market by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. The fluid pressure developed by the hydraulic unit is transmitted to the riveter by flexible high-pressure hose to provide a rapid advance of the ram to the rivet, the proper driving speed, and a rapid return of the ram to its normal position.

Depressing the pilot trigger switch operates a solenoid-actuated valve which permits the fluid under the primary pressure to flow directly to the riveter cylinder. At the instant the riveter ram or plunger has preformed the rivet to whatever shape is within the capacity of the primary pressure, the intensifier acts automatically to boost the pressure to the amount required for finishing the rivet.

When the maximum pressure has been exerted on the rivet, the primary control valve is automatically reversed, and the ram is returned rapidly to the starting point, whereupon the primary control valve automatically shifts to its neutral position. Merely relieving the pilot trigger switch will instantly reverse the ram movement, whether it be in the primary or high-pressure stage of the riveting cycle. Depressing this switch will change the return ram movement to a forward or driving stroke. As long as the operator depresses the pilot trigger switch the riveter will complete a cycle and stop. The switch must be released and depressed again in order to start another cycle. A low-voltage transformer built into the pilot trigger switch circuit protects the operator.

The unit illustrated exerts a pressure of 20 tons on the dies and is capable of driving 3/8-inch rivets, cold-forming a full button head. Other units are available in both portable and stationary types for driving hot rivets up to 1 1/8 inches in diameter.

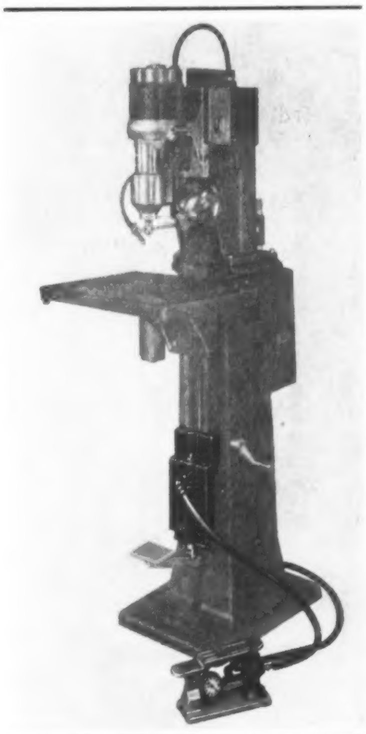
Air Control for Haskins Tappers

The tapping machines made by the R. G. Haskins Co., 4634 W. Fulton St., Chicago, Ill., can now be equipped with an air-operated control system designed to give greater accuracy, longer tap life, less tap breakage, and reduction of tapping costs. The new unit actuates the foot-pedal of the tapping machine by means of an air-operated plunger.

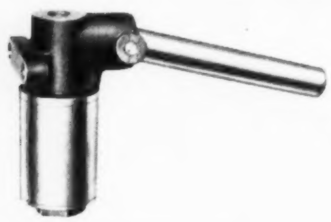
The foot-pedal, which is regular equipment on the tapping machines, controls the electric motor through a safety pull spring to the tap head. This standard arrangement gives very sensitive control. However, with the new air control, the sensitivity and accuracy of the tappers is still further increased and their operation is less fatiguing.

The foot-operated valve of the new unit is connected to a source of compressed air and controls the air delivered to the cylinder. This device controls the feeding speed and reversal of the tap, and also maintains a uniform pressure throughout the stroke.

With the compressed air control, the operator does not have to gage the pressure applied to the tap. Thus the variable and somewhat uncertain human element can be replaced by a pneumatic control that can be accurately regulated to meet requirements for each tapping job.



Haskins Tapper Equipped with Air Control



Safety Air Valve Brought out by C. B. Hunt & Son

Safety Air Valve for Punch Presses

A hand-operated air valve designed to insure the safety of press operators has been added to the line of "Quick-As-Wink" valves made by C. B. Hunt & Son, Salem, Ohio. This valve is so designed that it is practically impossible for a press operator to block or hold it open without grasping the control lever with his hand. Thus the operator's hands are entirely out of the danger zone when actuating the valve levers to put the press in operation.

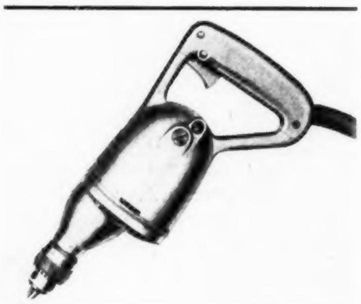
On presses operated by foot control, two of these valves are used in series to compel the operator to keep both hands out of danger while the press is being operated. When the press is actuated by a hand-operated valve instead of the foot valve or other control, it is only necessary to install one valve in series with the usual operating valve. Thus in any case, the installation of one or two of these safety valves provides adequate protection for the operator's hands and arms. This valve is guaranteed against leakage and is so designed that any increase in air pressure automatically tightens the air seal.

The valve is made in three different sizes with 1/4-inch inlet and 3/8-inch outlet; 3/8-inch inlet and 3/8-inch outlet; and with 3/4-inch inlet and 3/4-inch outlet. This valve is designed in such a way as to avoid metal-to-metal wear.

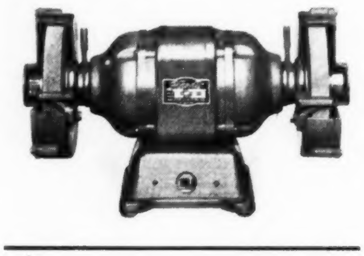
Signal Light-Duty Portable Electric Drill

A 1/4-inch light-duty electric drill designated as OB-8 has been added to the line of portable drills made by the Signal Electric Mfg. Co., Menominee, Mich. This drill is especially adapted for intermittent service in wood and metal assembly work, radio repair work, and airplane construction. It has an aluminum alloy housing, wool-packed bronze bearings, and a thrust ball bearing on the spindle shaft.

The air-cooled handle has a trigger type switch which can be locked to obtain continuous operation. The universal motor can be operated by direct or alternating current of 110 to 120 volts, 25 to 60 cycles. The drill is 12 inches long and 3 3/4 inches wide, and the shipping weight is 7 pounds. The equipment includes an Almond three-jaw chuck and 8 feet of heavy-duty rubber-covered cord with a rubber cord protector and a rubber plug.



Signal Light-duty Portable Electric Drill



Baldor 1/2-horsepower Bench Grinder

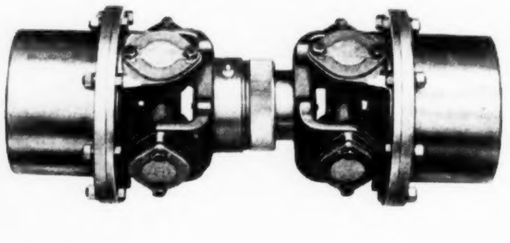
Baldor Bench Grinder

A bench grinder equipped with a capacitor type motor, which, it is claimed, will not burn out even though repeatedly overloaded has been brought out by the Baldor Electric Co., 4300 Duncan Ave., St. Louis, Mo. This grinder is designated as Type No. 3240 and has a motor rating of 1/2 horsepower at its operating speed of 3450 revolutions per minute. The grinding wheels are 7 inches in diameter, have a 1-inch face, and are mounted on a heavy shaft.

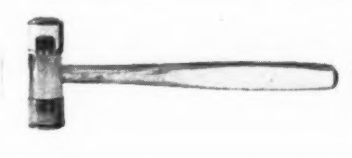
Other features include closed guards, tapered end bells, and a clearance type motor frame which facilitates grinding long or odd-shaped pieces.

Watson-Spicer Flexible Drive Shaft

A drive shaft for transmitting power from one machine to another, which can be easily applied and which compensates for any angular misalignment up to 20 degrees or an endwise movement of 1 inch or more, has been developed by the H. S. Watson Co., 525 Fourth St., San Francisco, Calif. This new product is designated as the Watson-Spicer needle-bearing drive shaft. The drive unit is made in any desired length from a few inches up to several feet. Its design embodies the use of four needle bearings which operate in oil.



Watson-Spicer Needle-bearing Drive Shaft



Bonney Soft-face Hammer

Bonney Soft-Face Hammers

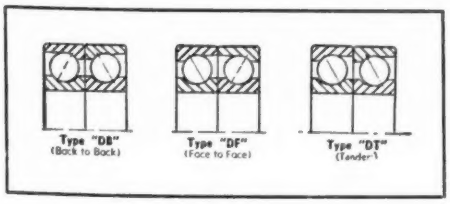
A line of soft-face hammers having tips or faces of a tough amber-colored composition that will not shatter, chip, or break has been brought out by the Bonney Forge & Tool Works, Allentown, Pa. These hammers are intended for use in fitting bushings, pins, and similar work having surfaces that must not be scratched or marred.

Should the hammer tips become badly worn, they can be easily replaced by new ones. Balanced hickory handles are securely locked in the heads of the hammers, which may be had in three sizes weighing 1 1/2 ounces, 1/2 pound, and 1 pound.

Fafnir X Type Duplex Ball Bearings

Any one of three mounting arrangements can be used with the X type duplex ball bearings brought out by the Fafnir Bearing Co., New Britain, Conn., for high-speed grinding spindle applications. The user can install two of these bearings face to face, back to back, or in tandem, as illustrated.

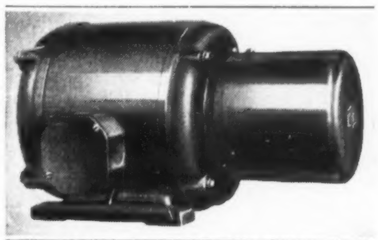
These new units, like all duplex bearings, consist of two matched single-row bearings operating with the rings clamped tightly together. They are particularly adapted for use where extreme shaft rigidity is required in order to obtain vibrationless operation of high-speed spindles when precision and finish are important considerations. These bearings are of the continuous raceway design and are fitted with composition retainers. They are now available in nine commonly used sizes and capacities.



Three Different Mounting Arrangements for Fafnir X Type Duplex Ball Bearings

Cutler-Hammer Motor-Mounted Brake

A totally enclosed, automatic solenoid brake for alternating- or direct-current electric motors



Motor Equipped with Cutler-Hammer Brake

from fractional horsepower sizes up to 10 horsepower, running at 3600 revolutions per minute, has been brought out by Cutler-Hammer, Inc., 264 N. 12th St., Milwaukee, Wis. This brake can be supplied mounted on any motor, and is available with dust-tight, weather-proof, and water-tight enclosures. The mounting of the brake on the motor saves time and expense in mounting and aligning.

This brake is especially suitable for use on machine tools, presses, textile and woodworking machines, as well as hoists and elevators. The rotating member consists of a single wear-resisting, heavy, molded disk which has shown but little wear when subjected to exhaustive tests. An enclosing case protects it from dirt and mechanical injury. Its appearance harmonizes with the motor.

Packaging Machinery Manufacturers Meet

The annual convention of the Packaging Machinery Manufacturers Institute was held November 11 and 12 at the Edgewater Beach Hotel, Chicago, Ill. The main subject of the meeting was the sales policies and sales problems of the packaging machinery industry. General industrial problems were also discussed. J. W. Hooper, comptroller of the American Machine & Foundry Co., addressed the meeting on "The Federal Revenue Act of 1936 as it Applies to the Surtax on Undistributed Profits." J. B. Hayford, Director of the Museum of Science and Industry, Chicago, spoke on "Machinery in the Modern Dynamic Museum."

* * *

High-Speed Steel Drills 0.002 Inch in Diameter

Flat drills of high-speed steel ranging in diameter from 0.100 inch down to only 0.002 inch have recently been placed on the market by the Grobet File Corporation of America, 3 Park Place, New York City. These drills are particularly suitable for use in the manufacture of dies, carburetors, ejectors, electrical instruments, etc. They are said to maintain their accuracy in drilling up to 15,000 holes.

* * *

All industry and all engaged in industry are subject to the will of the customer, the buyer. He is the one who fills the pay envelope of the man in the factory; he is the one who pays the salary of the man in the office; and he is the one who writes the dividend check for the investor. Only as we render a service for which the buyer is willing to pay can any industry live and prosper. When we hear the current stories of the oppressive power of great industries, it is well to remember that industry, be it large or small, is always the servant of the ultimate consumer.—*S. Wells Utley, President, Detroit Steel Casting Co.*

Welding, the Main Topic of the Acetylene Association Meeting

The thirty-seventh annual convention of the International Acetylene Association was held at Hotel Jefferson, St. Louis, Mo., November 18 to 20. The subject of welding was strongly featured in most of the papers read before the convention.

Among the papers read, the following were directly concerned with welding: "Oxy-Acetylene Welding in Plant Construction and Maintenance," by Berthoud Clifford, vice-president of the Radiant Fuel Corporation, St. Louis; "Welding of Cupro-Nickels and Silicon-Copper Alloys," by I. T. Hook, research engineer, the American Brass Co., Ansonia, Conn.; "How Design for Welding Defers Obsolescence and Increases Profits for Manufacturers and Users of Metal Products," by Erik Oberg, Editor of MACHINERY, New York; "Welding in Mining Operations," by G. Stuart Jenkins, general superintendent of the Consolidated Coal Co., St. Louis; "Potential Welding in Heavy Construction Industries," by Charles H. Ellaby, civil engineer of the U. S. Engineer Department, St. Louis; "Oxy-Acetylene Welding Practices in the Metal Mining Industry," by H. R. Wass of the St. Joseph Lead Co., Bonne Terre, Mo.; "Standards for Quality of Welding for Power Piping," by W. D. Halsey, assistant chief engineer of the Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.; and "Oxy-Acetylene Welding in the Operation and Maintenance of Pipe Lines," by R. P. Gonzales, assistant superintendent of the Pipe Line Division of the Arkansas-Louisiana Gas Co., Shreveport, La.

The following papers dealt specifically with metal cutting: "Preparation and Cutting of Plate Steel for Cars," by B. F. Orr, superintendent of car shops of the Cleveland, Cincinnati, Chicago & St. Louis Railroad, Beech Grove, Ind.; "Oxy-Acetylene Cutting in the Production of Heavy-Duty Dirt-Moving Equipment," by R. G. LeTourneau, president of R. G. LeTourneau, Inc., Peoria, Ill.

The welding of piping was dealt with in the following papers: "Power Plant Piping," by Wilson A. Benoist, assistant engineer of Anheuser-Busch, Inc., St. Louis; "Why Should Piping Contractors Recommend Welding to Architects and Engineers?" by Sherman T. Seeley, sales engineer of the Midwest Piping & Supply Co., Inc., St. Louis; "Progress in Pipe Line Construction," by T. R. Jones, president of T. R. Jones, Inc., Dallas, Tex.

In addition, a welding and cutting forum with demonstrations was held during the convention, as well as a session devoted to welding and cutting round-table discussions. During the convention, the Morehead medal was presented to Dr. David S. Jacobus, of the Babcock & Wilcox Co., for his leadership in the formulation of codes and procedures that have made fusion welding acceptable for many purposes, especially in the power plant field.

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Metals and Plastics Bureau

The permanent exhibition in the International Building, Rockefeller Center, New York City, which has heretofore been known as the Metal Products Exhibits, Inc., will be known in the future as the Metals and Plastics Bureau. The displays and exhibits constantly show new developments in the metals as well as in the plastics industry. Last month a special exhibition of plastics was shown. During December, the field of aviation will be featured.

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Automobile Laboratory for Lubricating Problems

A portable lubrication demonstrating laboratory mounted in the specially equipped body of an automobile, with the panels and bases of the laboratory apparatus attractively finished in Micarta, has recently been completed by the Standard Oil Co. This portable laboratory is used by the company to help engineers solve their lubrication problems.

All types of bearings, including roller, thrust, and ball bearings, are so connected with motors and meters as to permit direct observation of the effects of the physical laws which apply to their lubrication. By varying the operating conditions of the bearing, the correct depth of oil-grooves, the proper speed and pressure of the oil feed, and other important features are determined.

Portable Laboratory Equipped for Solving Bearing Lubrication Problems

* * *

Why all this talk about curtailing production when we know that *we have never yet produced as much as our people want?* Yet there are some today who cry that we have reached the end of the road; that there are no new industrial fields to conquer; and that opportunity is dead.—*Charles R. Hook, President, American Rolling Mill Co.*